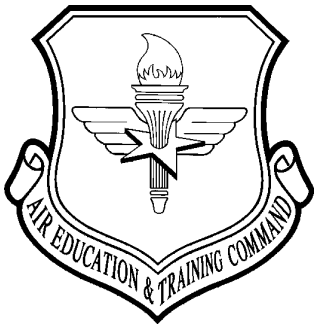
Flying Training

Preparing Flying Training Specialized Publications

January 2000



Air Education and Training Command

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4325

AETC Handout

January 2000

This handout is directed by AETCI 36-2221, *Flying Training Specialized Publications.* It provides instruction and reference to plan, organize, write and format AETC flying training publications. Follow the instructions and figures as closely as course material permits. Although the flying programs differ, the format and relative order of topics should be similar. The next planned revision is January 2002.

Supersedes AETC TRSS Handout, *TPM Guide to AETC Flying Training Publications,* July 1997.
Pages: 114
OPR: HQ AETC/DOFI (Mr. John P. Fosdick, DSN 487-6341)
Approved by: Col Terence L. Gilbert
Distribution: X

Contents

Chapter 1

Basic Concepts and References

Introduction

This handout describes procedures for writing syllabuses, examinations, instructor guides, student guides, and checklists.

Publications

AETC Flying Training Publications

AETCI 36-2205 — *Flying Training Student Administration and Management*

AETCI 36-2211 — *Aircrew Qualification and Training*

AETCI 36-2220 — *Academic Training*

AETCI 36-2221 — *Flying Training Specialized Publications*

Course Control Documents

The syllabus and course training standard (CTS) are the primary control documents for flying training. They are usually combined into one publication.

Syllabus — specifies all training events and prerequisites. Additions or deletions of academic lessons or flying hours require a syllabus change.

Course Training Standard — prescribes standards, and specifies levels of performance and knowledge students require to graduate. A CTS lists specific job elements, functional knowledge, and the required performance level.

Course Documents

AETC publications for flying training courses provide the primary source of information for instructors and students.

Instructor Guide (IG) — provides the instructor with the information, media and sequence of instruction.

Student Guide (SG) — contains subject information about the objectives in each lesson, reading assignments, and review exercises.

Checklist (CL) — a ready reference of procedures for the instructor or student.

Handout (HO) — contains guidelines or training material in the form of booklets, charts, tables, schematics or diagrams to augment other publications.

Examination — measures the students' mastery of course objectives.

Publication Currency

Use critiques and course reviews to generate timely changes and revisions to training publications which reflect changes in procedures, policy or technology.

Critiques — identify areas where currency, relevancy or coverage of material may be improved.

Reviews — required annually for currency, technical accuracy, and adequacy.

Changes and Revisions — implement the improvements.

Editorial References

AFH 37-137, *The Tongue and Quill* — for official use by USAF personnel.

Webster's Ninth New Collegiate Dictionary — selected as the standard for Air Force spelling and word definition.

United States Government Printing Office (GPO), *Style Manual,* March 1984 — By Act of Congress, the Public Printer is authorized to determine the form and style of government printing. The *Style Manual* is the product of many years of public printing experience, and its rules are based on principles of good usage and custom in the printing trade. In addition, it attempts to keep abreast of, and sometimes anticipate, changes in spelling, grammar, and type production. It has grown with government, and the ever-expanding body of language, with new terms and expressions. It's a standardization device designed to achieve uniform word and type treatment, and it aims for economy of word use. These rules are made to prepare and typeset manuscripts in the most economical manner.

Chapter 2

Instructional System Development

References

AFPD 36-22, *Military Training* — mandates the use of Instructional System Development (ISD) for all Air Force training.

AFMAN 36-2234, *Instructional System Development* — This manual describes the application of ISD principles for the development and accomplishment of education and training programs in the United States Air Force. It presents an instructional design model to develop and maintain efficient and cost-effective instructional systems.

AFH 36-2235, Volumes 1 through 11, *Information For Designers of Instructional Systems* — These handbooks provide specific guidance to apply the ISD principles described in AFMAN 36-2234.

Vol 1 *Executive Summary*

Vol 2 *ISD Automated Tools/What Works*

Vol 3 *Application to Acquisition*

Vol 4 *Guide to Training Technologies*

Vol 5 *Interactive Courseware (ICW) Design, Development and Management Guide*

Vol 6 *Guide to Needs Assessment*

Vol 7 *Design Guide for Device-Based Aircrew Training*

Vol 8 *Application to Aircrew Training*

Vol 9 *Application to Technical Training*

Vol 10 *Application to Education*

Vol 11 *Application to Unit Training*

We will concentrate our discussion on Volume 8.

AFMAN 36-2236, *Handbook For Air Force Instructors* — presents basic principles of instruction and their application in Air Force learning. The text describes how people learn and communicate. It describes various methods and techniques, ways to evaluate learning, and the reasons for evaluation. This manual is for instructors engaged in OJT and informal instruction as well as those assigned to Air Force schools.

Information

Air Force ISD is a conceptual adaptation of systems engineering used to develop, implement and evaluate instruction. ISD is systematic and flexible. It determines *whether* instruction is necessary, defines *what* instruction is needed, and ensures development of *effective*, cost-efficient instruction. The product of ISD is a total quality instructional system.

Figure 2-1 depicts an ISD model. Although the phases seem to imply a sequence, some phases may proceed simultaneously. You may not use all the phases, since the job performance training requirements are usually already accomplished. There should also be crossfeed, so earlier phases may be revised based on the results of later ones. Remember, ISD is dynamic and creative.

The model has three distinct, yet interrelated parts — system functions, ISD phases, and quality improvement.

System Functions

Management — directs or controls instructional system development and operations.

Support — maintains all parts of the system.

Administration — day-to-day processing and record keeping.

Delivery — brings instruction to students.

Evaluation — a central feedback "network" for gathering data through formative, summative, and operational evaluations to assess system and student performance. Evaluation is integrated into each of the four ISD phases.

ISD Phases

Analysis

The instructional designer analyzes the job performance requirements and develops a task list. These requirements may also include skills such as problem solving, leadership, and management. The task list is compared with the knowledge, skills and abilities of incoming students. The difference determines what instruction is needed. This task listing should specify what, why, when, where, who, how, and how well each task must be accomplished. Formative evaluation begins during this phase with process and product evaluation.

Analysts must identify the steps involved in task performance and determine the knowledge and skills needed. We're talking *performance*. Tasks are things people *do*. The Air Force pays people to *do* things, not just to *know* things. By focusing on the observable activities people must accomplish, the analysis maintains a constant relationship with job requirements. The *knowledge* people require must be linked to specific tasks, so we save money and resources by not overtraining.

Design

The instructional designer develops a detailed plan of instruction, to include selecting the instructional methods and media, and determining the instructional strategies. The objectives, examinations, and implementation plan are also developed in this phase. Process and product evaluations continue.

Development

The designer develops both the instructor and student lesson materials in this phase. If the media selected during the design phase include videotapes, sound-on-slides, interactive courseware, or training devices, they are also produced. The implementation plan is also updated. Validation in this phase includes the following:

- An internal review of the instruction and materials for accuracy
- Individual and small-group tryouts
- Operational (field) tryouts of the entire system

The last step is to finalize all instructional materials.

Implementation

Once developed, the instructional system is given to the user. Internal and external operational evaluations provide the necessary feedback for the operating system life cycle.

Evaluation

Evaluation is a continuous process beginning during the analysis phase and continuing throughout the entire life cycle of the instructional system. *Evaluation* is not *validation*. *Validation* answers the question, "Did the lessons we developed achieve the objectives?" *Evaluation* answers the question, "Is what we're instructing relevant to the job performance requirements (external evaluation) and are we maintaining the quality of instruction (internal evaluation)?" There are three types of evaluation:

Formative — process and product evaluations conducted during the analysis and design phases, and validation conducted during the development phase with individual and small-group tryouts.

Summative — operational tryouts conducted as the last step in the development phase.

Operational — periodic internal and external evaluation of the operational system during the implementation phase.

Summary

In the ISD model in Figure 2-1, all phases are connected, because ISD never ends. It's incorrect to say that a course has been "ISD'd" because of the continuous process involved. System characteristics change, so maintaining and revising the instructional system is continuous.

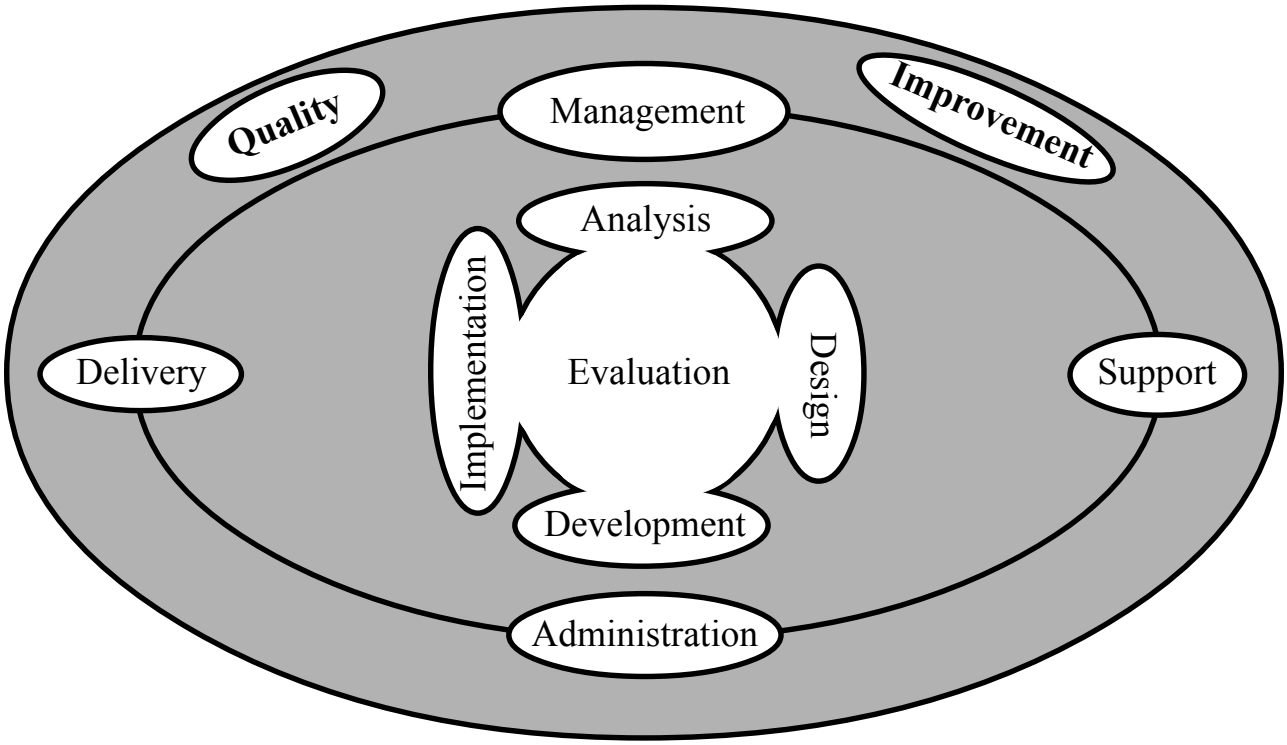


Figure 2-1 — ISD Model

Chapter 3

Objectives

Introduction

Objectives answer the question, "What must students do to show they've learned what's expected?"

Information

Objectives

Task requirements determine objectives, and objectives provide the basis for measurement in examinations. Objectives also provide the foundation for instructional material. The content of your material covers the skills and knowledge needed to achieve the objectives. Your objectives specify the students' achievement in observable performance.

Types of Objectives

There are two types of objectives — knowledge and performance.

Knowledge Objectives — determine what students know. They require students to select a correct answer, complete a sentence, or describe procedures in written or spoken form.

Knowledge objectives are either task-knowledge or subject-knowledge. *Task-knowledge* is needed to complete a task. For example, matching the terms "preset frequencies" and "guard frequency" with their functions will tell you if a student can operate a radio. *Subject-knowledge* concerns a subject related to a task but not necessary to complete the task. For example, knowing the location of FLIP charts is subject-knowledge and would not help you complete a low-level navigation sortie. We usually write task-knowledge objectives.

Performance Objectives — require actual performance of a task and use psychomotor skills. For example, an objective to change a tire requires more physical than mental activity. Completing performance objectives leaves little doubt whether the student can do the task. You will seldom write a performance objective.

Categories of Objectives

Terminal Objectives — are also called criterion, end, main, and primary objectives because they are the criteria to determine student achievement. These objectives reflect job performance requirements, establish the focus of training, and provide a guide for the learning process. They state what the student is expected to accomplish when instruction is complete and provide a sense of direction for both instructors and students. State the objectives briefly and clearly so the student can determine exactly what is required.

Enabling Objectives — are also called secondary, subordinate, and supporting objectives and are written for supporting skills and knowledge. They enable the student to accomplish the terminal objectives. They are usually simpler because they are subtasks of the main task.

Write a terminal objective for each main task. You may also need enabling objectives. Writing enabling objectives for supporting skills and knowledge can help to ensure your terminal objective, examination, and instructional material completely cover the task.

Parts of an objective

The objective must have three parts — performance, condition and standard.

Performance

The most important part of any objective is its clear, precise specification of performance. Another term is "learned capability." Your objective must be observable, achievable and measurable; it tells the students exactly what they must do to show they've learned a specific task. Every performance statement must include an *action verb.* In an example objective, "Be familiar with the procedures for a ground egress.", you cannot observe or measure the verb "Be familiar with." A better example is "List the correct procedures for a ground egress." You can observe and measure the student's ability to list these procedures. Consider these other verbs when writing objectives:

Classify	Label	Solve
Compute	Match	State
Determine	Operate	Write
Identify	Select	

The action verb alone does not completely specify the performance. The verb answers the question, "Do what?" But another question arises, "To what?" We answer this question by providing an object and a more complete description. Consider this example:

Do what?	Replace (verb)
To what?	Fuses (object)

Ensure your objective doesn't communicate multiple performance. Here's an example of incorrect and correct performance statements.

Incorrect (multiple performance) — Match names of the engine components and state their functions.

Correct (single performance) — Match names of the engine components with their functions.

Conditions

When describing precise performance you must also state the *conditions* and *limitations* of performance. This second part of an objective is called the *conditions,* and includes one or more of the following factors:

Assistance	Equipment	References
Environment	Forms	Safety

Objectives must include all conditions affecting performance. Specify the conditions to ensure the performance stated in the objective occurs under the same situation each time.

Remember, objectives are written for an academic environment, so the given conditions may differ from the real-life conditions. The conditions may also be implied if they are obvious. For example, if your objective states "Fly a Cuban Eight maneuver.", the implied conditions would be "in a T-38, in daylight." These are obvious. Be cautious when using implied conditions since they can be misunderstood. If in doubt, write it out.

Standards

The last part of an objective is a standard of performance. The standards tell what to measure or compare the student's performance against.

Standards may be described in several ways. The following are the most common:

1. Degree of accuracy (70, 80, 90 or 100 percent)
2. Degree of assistance (instructor, T.O.s, notes)
3. Time limits (1 hour and 50 minutes)
4. Standards prescribed elsewhere (T.O.s, FLIP)
5. Safety — No safety violations are permitted. If any tolerance is allowed, you must state how much.

To tie the three parts of an objective together, consider the following example:

"Given the surface winds, runway heading, and T-37 Takeoff and Crosswind Landing Chart, compute minimum nosewheel liftoff/touchdown speed within 1.5 knots."

This example is divided into the three parts of an objective.

Conditions — "Given the surface winds, runway heading and T-37 Takeoff and Crosswind Landing Chart, …

Performance — … compute minimum nosewheel liftoff/touchdown speed …

Standards — … within 1.5 knots."

Strive to write this type objective.

Testing Constraints

Objectives must reflect the job performance requirements. When you write, consider certain constraints limiting the "realism" of the objectives. These constraints usually involve measurability and time.

Objectives and testing go hand in hand. ***Construct examinations directly from your objectives, before you begin writing the courseware.*** When writing objectives, you must carefully consider how they can be measured. Although your objective may be technically correct, if a suitable test cannot be developed to measure the performance, then your objective is not acceptable.

Time is another constraint to consider. You have a specific amount of time allotted for testing. If the performance called for in the objectives requires a longer period, you may need to modify the performance, conditions or standards. Consider how long it takes to test each performance versus how much time you have for the examination.

Summary

This chapter covered the information you need to write quality criterion objectives. Your objectives must be clear and well-stated so student achievement can be measured. They must contain performance, conditions and standards. You must also consider the testing constraints when developing objectives.

Chapter 4

Preparation

Introduction

This chapter provides authors with procedures and techniques to prepare publications. Before beginning to write, read and follow these instructions.

Always strive to produce a technically accurate manuscript with correct grammar, spelling, punctuation, organization and format. All courseware will be thoroughly reviewed, edited and revised, but the ideal product is ready for print before editing. Refer to the specific chapter for the correct format, and open the appropriate document in the *Cover Pages* folder on the file server.

Organize your course objectives first and ensure they are stated correctly, then write the examinations. After all exam versions are complete, write the main topics to teach your objectives in an outline format. This document will become the instructor guide. The student guide will follow as you expand on each topic outlined in the IG. Always try to write brief, present tense, active voice sentences. Determine precisely what needs to be said, then state it in a concise, logical order. Faulty organization is the single greatest flaw in our courseware.

Seek advice and guidance from other authors to learn how they handle similar subjects. Consult other subject matter experts on difficult technical questions.

If an existing guide is technically adequate, don't just copy it verbatim and submit it as a revision. Usually there are many areas to improve, so review it carefully from the student's viewpoint. Don't rewrite it just for the sake of change.

Another purpose of this chapter is to ensure stylistic consistency for courseware development. This concept ensures that communication is standard, simple, direct, concise, and precise. Stylistic consistency does not imply inflexibility. Many situations have several options for spelling, punctuating, or using words. Use the preferred method unless there is a good reason for using another form. Personal likes or dislikes are not a good reason. Strive for consistency throughout your courseware.

Abbreviations

AFM 11-1, *Air Force Glossary of Standardized Terms*, is the basic reference for abbreviations. The Style Manual, Chapters 9 and 21, may also be used, but AFM 11-1 has precedence. Abbreviations not listed or different from ones in these references may be used if they are supported by subject matter publications or collective opinion.

Use the abbreviation if we ordinarily use it rather than the entire word or phrase (e.g., *RPM* instead of *revolutions per minute*; *amps* instead of *amperes*). Don't use an abbreviation unless it's more familiar than the complete term. Spell out uncommon abbreviations, acronyms and initializations the first time they're used. When using a large number of abbreviations or acronyms, add a glossary as an attachment.

When presenting quantitative data, spell out the dimensions unless space considerations require abbreviations for such terms as *feet* or *inches*. Abbreviations may also be used in illustrations. We usually don't abbreviate single-syllable words.

Examples	10 inches	1 mile	4 hours
	100 feet	6 ohms	12 watts

Abbreviations of measurement and quantity are separated from the number by a single space.

Examples	27 cm	6 mm long
	35 kw	2 dB

However, remove the space between mm (millimeter) and the numeric value when indicating the size of cameras, films, weapons, etc. Also, omit the space when the degree symbol is used alone.

Examples	16mm camera (but, the film is 16 mm wide)		
	7mm rifle	98.6 °F	43 °C

Capitalization

If names or abbreviations are stamped on equipment, such as switch or throttle positions, then capitalize.

Examples Place the throttle in IDLE.

Turn the battery switch ON.

Capitalize names such as Air Force or Army when they refer specifically to the US Air Force or the US Army. If referring to any air force or army, such as, "A strong army is essential to a nation's strength.", do not capitalize. Also, the term "numbered air force" should not be capitalized unless it refers to a specific organization, such as Nineteenth Air Force. Don't capitalize squadron commander, flight commander, or branch chief unless referring to a specific person such as 19 AF Commander or AETC TRSS Commander. Words such as NOT, NEVER, and EXCEPT may be capitalized for emphasis.

Boldface, *italics,* or ***boldface+italics*** may also be used to emphasize certain words or phrases.

Examples What is the **sum** of all factors?

What is the *sum* of all factors?

What is the ***sum*** of all factors?

Avoid an underline because it interferes with the five lower case letters, gjpqy. If you must underline, use the "rule below paragraph" option or an inline graphic.

Compounding Words

Follow the *Style Manual* hyphenation rules. Hyphenate the abbreviations of hyphenated words. Consistency in all courseware is mandatory.

Example foot-pound, ft-lb

Use the exact titles of publications or forms. If the title contains a hyphen, use it even though the *Style Manual* may state otherwise.

If the meaning of the second word in a compound adjective refers to only the first word, use a hyphen.

Examples The fine-grained film.

The film is fine grained. (no hyphen needed)

Materials-handling equipment (handling refers to materials)

AF flying clothing (the meaning is sequential, so no hyphen is needed.)

Don't use a hyphen if the first element of a compound adjective is comparative or superlative, or is an adverb ending in "ly."

Examples a coarser threaded bolt

most suitable route

highest gain amplifier

properly installed fuel cells

better suited torque wrench

An improvised compound normally should be hyphenated. Most compounds with a noun and verb fit this category.

Examples If a specialist tack-welds two plates …

All bolts should be safety-wired …

Use a hyphen to separate combinations of figures, letters, or figures and letters (*Style Manual* 8.74). A hyphen adds to the readability of abbreviations such as CBPO-OJT, position 5-c, or stock number 77N-B-9901.

Hyphenate unit modifiers and hyphenated words at the end of a line and place on two lines (*Style Manual* supplement on word division).

Not acceptable

Which one of the following fine-grain-ed films should be used?

Acceptable

Which one of the following fine-grained films should be used?

Which one of the following fine-grained films should be used?

Not acceptable

Which staff function at HQ AFMC, Wright-Pat-terson AFB, Ohio …

Acceptable Which staff function at HQ AFMC, Wright-Patterson AFB, Ohio …

Keep all parts of a hyphenated unit together.

Not acceptable Which priority is required by stock number 77N-B-9901 ?

Acceptable Which priority is required by stock number 77N-B-9901?

Form and Publication Titles

Use the exact number and title of standard forms or publications. Skill knowledge should not include memorizing forms or publication numbers.

When referring to a specific block or section of a form, cite the title of that block or section.

Example Block 23, PRIORITY, of AF Form 175

When a form or publication is repeatedly referenced in the same course material, you may choose to include the title only the first time.

Plurals

When is a plural idea singular?

Example — What does the signal given by two long, one short, and one long sound (or sounds) mean?

Since four sounds are referred to, technically the plural *sounds* should be used. Common sense dictates the singular, *sound*.

Two hundred milliliters is (are) the proper dosage. The purist will argue for *are*. However, when the idea conveyed by a plural subject is singular in intent (collective usage), the verb is usually singular. Avoid the problem of a singular predicate with a subject that may be singular or plural by using *could, should*, *would*, or *will* in the predicate.

The symbol "×" (alt + 0125) may be used for "by" in expressions such as 8×10 inches. Don't use "x" or "X." If used as a unit modifier, place a hyphen between the last digit and the dimension.

Example an 8×l0-inch photograph

Punctuation

Apostrophe (*Style Manual* 8.3 to 8.18)

Always use typographer's ("smart") apostrophes.

Use an apostrophe s ('s) to indicate the plurals of letters, figures and symbols *only* when adding just an "s" would be ambiguous.

Examples a's X's

An apostrophe should **not** be used to form the plural of acronyms and abbreviations.

Examples 1970s SKTs CBPOs
TDYs OPRs
but, "the OPR's desk," for possession

Comma (*Style Manual* 8.36 to 8.61)

Modern style discourages using the comma because it slows sentence movement. However, technical writing encourages careful, deliberate reading rather than rapid scanning, so commas assist good communication.

Uses of the comma

1. Between coordinate clauses

2. Between independent clauses connected by the conjunctions but, not, for

Example They are obviously mistaken, for all events are tiring.

3. Between independent clauses of a compound sentence connected by "and," "nor" or "yet," unless the clauses are short. In two-part questions, always use a comma to separate the parts.

Example What tool bit should be used to machine aluminum, and why?

4. After a subordinate clause or a long phrase preceding the main clause

Example If the control switch is on but the equipment does not operate, what components should be checked?

5. With interrupting and parenthetical elements

Example The shotgun, a weapon with great psychological effect, should be issued to which sentries?

6. For clarity

a. Before words with two functions (for, but)

Example All outputs are normal but Ql. Output from Q2 is normal, but Q4 is negative.

b. To prevent mistaking a noun for an object

Example When the boll weevil struck, the credit system collapsed. (NOT: When the boll weevil struck the credit system …)

c. Between smaller and larger geographical units

Example San Antonio, Bexar County, Texas

Quotation Marks

Always use typographer's ("smart") quotation marks.

Use quotation marks sparingly except for material actually quoted. Quotation marks should also be used following the terms entitled, the word, the term, signed, etc., as specified in the *Style Manual*.

Example What message is indicated by the term "Roger"?

However, if the word or phrase is entirely uppercase, boldfaced, or underlined, or is sufficiently identifiable from the text, quotation marks should NOT be used.

Example What message is conveyed by the term ROGER?

You may use some jargon or shoptalk if it's more familiar to the student, but don't enclose in quotation marks.

Sentence Structure

Tense — Use the present tense in most courseware since the facts are generally true without reference to time. *Should* may be used as an auxiliary to indicate correct action.

Acceptable — A supervisor reprimanded a subordinate for poor work. The reprimand would be more effective if it encouraged the subordinate to demonstrate what performance? (Past tense)

Better — A supervisor reprimands a subordinate for poor work. The reprimand is most effective if it encourages the subordinate to demonstrate what performance? (Present tense)

Person — Use the third person in your courseware. Avoid the second person "you." This technique precludes students from basing their choices on personal preference rather than prescribed procedure.

Active/Passive Voice — Technical writing emphasizes the *active* voice. Someone does something to the direct object of the sentence. In *passive* voice, the subject receives the action by someone or something. As a general rule, active voice is more direct, economical, and easier to understand.

Participle and Verbal Noun Phrases — A participle phrase is an adjective phrase and should modify a noun. If the participle phrase is not clearly linked with the subject of the main clause, the phrase will dangle.

Examples Reassembling an A-5A magazine, the winding gear should be timed with …

When reassembling the A-5A magazine, the winding gear should be timed with …

Grammatically, *reassembling* as a participle dangles in both items and should modify the subject of the main clause. Both examples lead to ambiguity. When writing exams, clarity is most important. The participle or verbal noun should be linked with the subject of the main clause and avoid the passive voice in the main clause. The previous examples should be restructured as: The winding gear should be timed with the … during reassembly of the A-5A magazine …

Acceptable — Computing the stock control level, the factors to be considered are the pipeline time, the number of days over which issues were accumulated, and the …

Better — The factors used in computing a stock control level are the pipeline time, the number …

If or When — Use *if* to describe situations involving uncertainty or suppositions (especially useful for malfunction questions). *When* implies something definitely will happen.

Acceptable — What action should a specialist take when the GO indicator fails to light during the gyrozero check?

Better — What action should a specialist take if the GO indicator fails to light during the gyrozero check. (Better since *if* implies the light may or may not light.)

Sentence Order

There are seven basic sentence patterns of direct statements.

Subject	*predicate*
We	study.

Subject	*predicate*	*direct object*
TPMs	develop	tests.

Subject	*predicate*	*indirect object*	*direct object*
We	give	students	tests.

Subject	*linking verb*	*predicate noun*
He	is	a pilot.

Subject	*linking verb*	*predicate adjective*
TPMs	are	well informed.

Subject	*predicate*	*direct object*	*obj. complement*
We	appointed	the NCO	chairperson.

Subject	*predicate*	*direct object*	*adj. complement*
We	will make	the test	more difficult.

There are three variations of these basic patterns: (l) questions, (2) passive voice sentences, and (3) imperative sentences. The question variation follows two patterns:

1. If a direct, affirmative statement has a verb with one or more auxiliaries, the first auxiliary is switched so it occurs before the subject.

Affirmative The test has been given.

Question Has the test been given?

2. If the affirmative statement contains no auxiliary, place some form of the verb "to do" before the subject.

Affirmative He passed the examination.

Question Did he pass the examination?

The preceding examples of questions require only a "yes" or "no" response. The same rules apply to questions beginning with an interrogative word. A closed-stem question requires the examinee to select a response to an interrogative word. The stem contains at least one of the following interrogative pronouns or adverbs:

Pronouns	*Adverbs*
What	How
Which	How many (much, often, far)
Who	When
Whom	Where
Whose	Why

Acceptable — If the equipment does not operate properly, the technician should check which component?

Better — If the equipment doesn't operate properly, which component should the technician check?

If a question can't be easily expressed in the interrogative sentence pattern, try an open stem or a stem containing more than one sentence.

Articles

Following an open-stem, the articles *a*, *an* and *the* may be used either at the end of the stem if the article is common to all choices or at the beginning of each choice if different articles are appropriate.

Examples

A procurement specialist should obtain approval for cost overrun expenditures from *the*

a. base finance officer.

b. base contract monitor.

c. MAJCOM plans division.

d. nearest DoD support agency.

A procurement specialist should obtain approval for cost overrun expenditures from

a. *the* base finance officer.

b. *the* base contract monitor.

c. *either* MAJCOM or SOA plans division.

d. *any* DoD support agency.

If the response consists of additional grammar elements, the articles should be repeated again in the response.

Examples

The law of parsimony states that

a. *the* simplest explanation of an event is preferred.

One purpose of the SKT is to prevent

a. *the* unknowledgeable airman from being promoted.

In open-stem questions, use articles for grammatical correctness. However, following a closed stem, omit the articles from the beginning of the choices if the meaning is clear without them.

The, called the definite article, often refers to something previously mentioned or a particular object.

Example An airman requests payment while in PCS status. How should *the* payment be recorded.

A and *an* are indefinite articles developed from the number *one* and usually imply *any*.

Example The green tag is on *an* equipment part …

Some nouns are collective in certain situations and may be modified by either *a* or *the.*

Examples What component on *the* B-5000 computer …

What component on *a* B-5000 computer …

Proper Names

Avoid using words or phrases that could offend someone's sex, race, age group, religion, ethnic background, political affiliation, or nationality.

Sex-relative pronouns create particular concerns in courseware. Air Force policy is to use sex-neutral words when possible. Avoid "he/she" and use plural pronouns and adjectives such as *they, them,* or *their.* Use *he, she, him, her, his,* or *hers* only when you *must* distinguish between male and female. In most cases, you can avoid male-oriented job titles such as "fireman" by using terms such as "fire fighter." *Avoid* creating new words that look ridiculous such as "airwoman" for "airman" or "freshwoman" for "freshman."

The Air Force prohibits joke or gag names for people, bases, or office designations. They usually appear in sample forms or letters and are not in good taste. Substitute a common name instead of an unusual one. For example, don't use HQ FLAP, Plush Palm AFB, Florida, 00001. Use the actual name of an Air Force base, including state and ZIP code.

Will, Should, May and Must

Will — normally indicates the future.

Example What condition *will* result if the thermal battery fails on a missile?

However, *will* is frequently used in the military to express mandatory requirements.

Example A flight surgeon *will* supervise the medical examination.

An alternative is to reword the stem, avoiding the use of *will* altogether, but still indicating a mandatory requirement.

Examples What action is a specialist required to take if the missile control system fails?

A flight surgeon must supervise the medical examination.

Should — indicates a recommended procedure or correct action.

Example Which one of the following tools should be used?

In this situation, the word *should* implies there may be several options, but a certain specific procedure *should* be used.

May — indicates an optional procedure or implies permission.

Example When *may* an airman submit an application for leave?

Must — indicates obligation or physical necessity.

Example What switch *must* be activated before engine start?

Relative Pronouns

Who and *that* refer to people. *Which* and *that* refer to animals, objects, situations, and collective nouns.

Use *that* in restrictive clauses, and *which* in both restrictive and nonrestrictive clauses.

(Restrictive, no comma) — The type of camera that is normally installed in the left oblique mount …

(Nonrestrictive, commas) — The K-22A camera, which is normally installed in the left oblique mount of the aircraft, has what size lens cone?

Omit *that* and *which* if the meaning isn't changed. The first example above should be written: The type of camera normally installed in the left oblique mount …

Confusion may arise when selecting a correct interrogative word or phrase. The rules are fairly simple.

Which — Used when the response is one of a limited number within the category and there is only one correct response.

Examples *Which* major command …? (Only a specific number)

Which month of the year …? (Only 12 to choose from)

Which resistor in the circuit …? (Only certain resistors are shown)

What — Used when the response is one of an indefinite or infinite number within the category and there is only one correct response.

Examples *What* agency has the authority to …? (Many agencies)

What procedure should be followed …? (Unlimited procedures)

What precaution should be observed …? (Many precautions)

But *Who,* not *what individual,* should report …?

Which of the following … are — Used when the answer is plural and there is at least one other correct response not listed as a choice.

Example

Which of the following installations *are* ACC bases?

a. Altus AFB and Charleston AFB

b. Hill AFB and Kelly AFB

c. Langley AFB and Offutt AFB

d. Randolph AFB and Vance AFB

Which *one* of the following … is — Used when the answer is singular and there is at least one other correct response not listed as a choice.

Example

Which one of the following installations *is* in Texas?

a. Columbus AFB

b. Keesler AFB

c. Randolph AFB

d. Vance AFB

We all know a singular subject requires a singular verb (Colonel Smith *is* happy.). We know that a plural (The dogs *are* lost.) or compound subject (Colonel Smith and Major Green *are* happy.) requires a plural verb. If in doubt, substitute "they" for the compound subject; the proper verb should then be obvious. (They is happy vs. they are happy)

Compound Subjects

Are the two parts of the compound subject considered as one unit? If so, use a singular verb.

Example Ham and eggs is an excellent breakfast. ("Are" may sound better to some but "is" is correct.)

Is the compound subject preceded by *each* or *every*? If so, use a singular verb.

Example Every dog, cat, and mouse is precious in the mind of a child.

Is the name of a company included in the compound subject? If so, use a singular verb.

Example Dowe, Cheatem, and Howe is a notorious law firm.

Collective Nouns

Collective nouns present the first use of the "either" grammar rule, and take either singular or plural verbs. If the collective noun refers to the group as a whole, use a singular verb.

Example The family *is* going on vacation.

Does the collective noun refer to individuals within the group? If so, use a plural verb.

Example Several recalcitrants *were* taken to jail. (Were all recalcitrants taken to jail? No, just a few, so use a plural verb.)

Indefinite Pronouns

Some indefinite pronouns are *always* singular — *another, each, every, either, neither and one*. Compound pronouns — *someone, everything, anyone, nobody,* etc. — are also *always* singular.

Examples Each of you *is* important.

Nobody *is* going home hungry.

Some pronouns are always plural — *both, few, many, others,* and *several.*

Example Others *are* attending class.

Some pronouns (all, none, some, more, most) depend on the noun referred to determine if they are singular or plural.

Examples None of the courseware *was* correct. (singular)

The issues were serious but all *were* addressed in the conference. (plural)

Six rabbits were in the hat but none *were* injured. (plural)

None *are* less understood than TPMs. (plural)

Verb Tense

Which verb tense is correct in the following sentence? "A training program manager is one of those workers who (is, are) totally dedicated to the job." What is the antecedent (the word that dictates verb tense) of *who*? Is it *those* or is it *one*? The common rules of grammar dictate that *those* is the antecedent; use a plural verb (are).

Periods and Quotation Marks

The most common problem in sentences that end with quotation marks is placing periods *after* the quotation marks. Rarely will a period fall after a quotation mark. Commas follow the same rule.

Examples Fly the AOA on final "in the green."

For a T-38, enter "T-38/P."

After confirming three green, call "Gear down," check your airspeed and look for the runway.

Notice the use of "smart quotes" and apostrophes in this text. Always use them in your writing.

The Semicolon

There is one basic rule for using the semicolon; the statements on both sides of the semicolon must be complete sentences. If either statement cannot stand alone, don't use a semicolon.

Example The mission of an author is to write, write, and write; don't you ever forget it!

Commas

The basic rule for commas is to use them as required, just don't overuse them. In a simple list, omit the comma before the "and" or "or." In a complex list, leave the comma in.

One easy technique to determine if a comma is needed is to read the sentence out loud. If a natural pause occurs at certain points, a comma is probably required.

Examples Aviators like jets, cars and cokes. (simple list)

Writing is a complex task consisting of dreaming up the words, writing them down, and finding someone to publish what you wrote. (complex)

Colon

A colon must follow a complete sentence or a statement that stands alone. Use a colon to introduce a list, following the style/format rules. Avoid placing a colon after the word "following" when introducing a list. A clause that ends in "following" probably is not a complete thought.

Examples The J-85 engine consists of the following major sections:

Accomplish the following actions before departing a prepared surface:

Em Dashes — may be used after an introductory word or clause. The first word after the em dash may or may not be capitalized, depending on whether it finishes a sentence or begins a new one.

Examples **Airfoil** — a cross-section of a wing.

False horizons — at night can be caused by any series of lights in a linear formation.

Note — To prevent injury, use care when loading the flare launcher.

In Times New Roman font, the em dash is Alt + 0151. Use a thin space before and after the em dash.

Spelling

There is no excuse for misspelled words in our courseware. The spell checking capability of the software should prevent problems. However, the spell checker cannot catch your misspelled words ***if you don't use it! Note*** — the spell checker will not catch the lower case letters such as "a" and "i" when upper case letters are called for.

Cockpit Indications

When referencing items in the cockpit or on the aircraft, use the descriptive terminology in the *Dash One*. For example, don't refer to the T-38 Engine Fire Warning Light as a fire light. Use the *Dash One* terminology.

Capitalize switch positions. For example, "Place the battery switch to ON." Another way of saying the same thing would be to write "Turn on the battery." Notice that no capitalization is required in the second example.

When referencing power and flap settings use the "%" symbol, not percent. For example, "Set a minimum of 80% RPM before accomplishing stalls." When using idle, military, or maximum in a sentence, spell out the words as in this sentence. If you reference a throttle position, use IDLE, MIL or MAX, just as stamped on the throttle quadrant in the aircraft.

Examples Select RAM DUMP.

Use military power for all climbs.

Use 60% flaps for a single-engine pattern.

Angle of Attack

Angle of attack is not hyphenated. AOA is acceptable after being defined in the text.

Feet, Inches and Gs

Generally, it's best to spell out feet instead of using the abbreviation. For example, use "Climb and maintain 6,000 feet." instead of "Climb and maintain 6,000 ft." Use a comma in all numbers above 999.

Use the keyboard provided quotation marks for feet (') and inches ("). Don't use smart quotes for these units of measurements. Use these marks for minutes and seconds of latitude and longitude.

The plural of G is "Gs" not "G's."

The use of "This"

Many writers incorrectly use "this" to reference a subject from a preceding sentence or clause. Using "this" in this way is often extremely confusing. For example, the following text was taken verbatim from our courseware:

Bank angle — As bank angle increases, level flight stall velocity also increases. This is due to the higher angle of attack on the high wing needed during the turn.

Can the reader know for sure what "This" in the second sentence refers to? Bank angle? Level flight stall velocity? Both of them? Perhaps the second sentence could be written in the following manner:

During a turn, the higher angle of attack on the high wing increases the stall speed.

Examinations

When giving an option to choose all or some of the answers, use the following format.

Examples All the above are correct.

Both a and c are correct.

None of the above is correct.

Miscellaneous

Do not abbreviate knots as "kts." Spell it out or use KIAS, KCAS, KEAS or KTAS.

Use a zero before the decimal when expressing Mach numbers.

Examples Fly at 0.9 Mach

Don't exceed 0.78 Mach below 10,000 feet MSL.

Planning

Don't begin writing or revising courseware unless your supervisor agrees it's necessary. This step can save unnecessary work and increase your chances of final approval. Before you start, review the material in this handout.

It's equally important to publish current information in changed or revised courseware as it is in new material. Don't take any statements for granted, particularly in older publications.

When deciding what to cover, ensure you understand the objectives. Develop the details to make your courseware complete, reducing the need for supplemental information. If any of your material is copyrighted, get a copyright release.

Research

Research is important when developing courseware. Inadequate research could lead to issuing more than one publication on the same subject, issuing conflicting instructions, or printing nonessential or incomplete publications. The research needed depends on your expertise, subject familiarity, objective requirements, and whether new or revised courseware is involved.

Ensure you have enough material to help students learn the required objectives. If you do not, research the subject further.

Organization

Arrange your material in the most logical and effective order. Prepare an outline and choose descriptive titles for the main parts. Identify the parts, lessons, chapters and paragraphs using organizational elements in Figure 4-2.

Write the text as simply as possible, using the paragraph as the basic element. If several paragraphs cover the same general subject, group them under the same main heading. Headings are optional for subparagraphs, but be consistent. If any subparagraphs have headings, all subparagraphs must have headings. Don't use a single subparagraph. If there is a subparagraph (1), there must be subparagraph (2).

Label and number all figures in numerical sequence and place the caption one pica below the figure. If the publication does not have chapters or lessons, use Figure 1, Figure 2, etc. If the publication has chapters, number figures by where they appear. For example, number figures in Chapter 1 as Figure 1-1, Figure 1-2, etc. All figures must be referenced in the text and be functional, not just decorative. Place figures as near as possible to the first paragraph referring to them, or place them at the end of a short chapter.

Place any extra material in attachments, including subject indexes, maps, glossaries and lists. Refer to each attachment in numerical sequence and number as Attachment 1, Attachment 2, etc. (Figure 4-2) Number figures in attachments according to where they appear: Figure A1-1, A1-2 in Attachment 1; Figure A2-1, A2-2 in Attachment 2. Do not list figures contained in attachments in the table of contents.

If you're writing a change, arrange the material in the same format as the basic publication.

Good organization is time-consuming, but it makes writing the draft much easier. Well-organized drafts usually need only minor rewriting.

Writing Effectively

Before starting, review the material in *The Tongue and Quill*, and Figure 4-3. No two people write exactly alike; however, you can improve communication if you use the following principles of good grammar and clear writing:

1. Good writing habits enhance readability. These techniques include choosing the proper source materials, using an interesting style, providing effective illustrations, and preparing the manuscript in the correct format.

2. When developing a new publication, choose a meaningful title and express it in a few words. Use only common abbreviations, such as USAF or JSUPT. Avoid terms such as handbook or book in the title.

3. Write in the active voice and avoid passive voice unless absolutely necessary.

4. Use the *present* tense and avoid the *perfect* tense. Use the word "will" to direct a mandatory requirement and not to indicate future tense.

5. Develop well-constructed sentences to enhance the readability of your publication. Use significant words, examples, applications and illustrations. A conversational approach increases interest. Emphasize important points so your readers understand the material.

6. The final measure of effectiveness is whether your writing helps students accomplish the objectives of the course. When students learn from your material and can apply that knowledge, then you've reached your goal of getting information from the written page into the students' minds.

Edit and Rewrite

A key technique in *writing* is learning to *rewrite*. If anything is unclear, rewrite it. Keep rewriting until it *is* clear. If possible, set your first draft aside for a few days. When you reread the draft, look at it more objectively. Read it as a student approaching the subject for the first time.

When reviewers proofread your material, consider their suggestions carefully. Since they are not as close to the material as you are, they may see more clearly where changes in word use or sentence and paragraph structure would improve your draft. Work with the reviewers to ensure their suggested changes don't affect the technical accuracy or meaning.

People do not write better simply because they are told to do so. They should be shown where their writing needs improvement and then guided to the changes needed. Be constructive and creative when you review.

Global Changes

When your draft is complete and you've finished a spell check, accomplish the following global changes in the order shown. Repeat the find and replace procedure until no further changes are made. The dialog box symbols are provided. (***Note*** — space = spacebar)

Purpose	***Find What***	***Change To***
Remove spaces before tabs	space ^t	^t
Remove spaces after tabs	^t space	^t
Remove spaces before paragraphs (¶ / enter)	space ^p	^p
Remove spaces after paragraphs (¶ / enter)	^p space	^p
Remove spaces before forced line breaks	space ^n	^n
Remove spaces after forced line breaks	^n space	^n
Remove tabs before paragraphs (¶ / enter)	^t ^p	^p
Remove tabs before forced line breaks	^t ^n	^n
Remove double spaces	space space	space
Proper spacing after colons	: space	: ^>
Proper spacing before and after En-dashes	space alt+ 0150 space	^< alt+ 0150 ^<
Proper spacing before and after Em-dashes	space alt+ 0151 space	^< alt 0151 ^<
Change hyphens to nonbreaking hyphens	-	^~
Change slashes to nonbreaking slashes	/	^/

Coordination

Follow policies and procedures in Chapter 13, Coordination Cycle. The cover date for training courseware is the date it must be available for use. Allow time for writing, editing, coordinating, printing and shipping. Use this handout to determine time requirements. Stay on schedule and keep your supervisor informed. Establish a realistic cutoff date for adding new material. If new material can wait until the next change or revision, don't delay your issue date.

Printing and Publishing

Complete AF Form 673, *Request to Issue Publication*, as shown in Chapter 13. Note the differences between syllabuses (Figure 13-7) and courseware (Figure 13-8).

Validation

Use actual classes and the *validation* process to ensure your course covers the objectives. New or revised courses are sent to the bases and feedback material is collected. This information is then analyzed to determine if the course is valid. The recommended minimum number of classes needed to validate the new or revised course is two. Collect and analyze the following validation feedback material:

1. Instructor and student critiques
2. ATC Forms 687, *Ground Training Critiques*
3. Examination analyses
4. Trip reports
5. Staff assistance visits
6. Inspection reports
7. Telephone conversations

Carefully prepared and edited publications often need only minor changes after validation. If you find weak areas, rewrite them. When the revision cycle starts, the OPR should review critiques to ensure maximum consideration of problem areas. When the revision is complete, coordinate and validate again.

Illustrations Checklist

1. Is the illustration functional?
2. Is the illustration legible?
3. Has the illustration been integrated with the text?
4. Does the text describe what to look for in the illustration?
5. Are the labels on the illustration consistent with the terminology used in the text?
6. Are the labels for identical parts consistent with other illustrations in the publication?
7. Is the caption concise and does it properly identify the illustration?
8. Is it the simplest illustration that can convey the information?
9. Are there elements in the illustration that distract the reader?
10. Does the illustration fit the background and experience of the reader?
11. Is the type of illustration the best for the purpose?
12. Will the illustration confuse the reader because too many things have been included?
13. Is the illustration the minimum size needed to clearly portray the desired information?
14. Is the style and technique of the illustration consistent with other of the illustrations?
15. Is the caption for the illustration centered under the illustration?

Figure 4-1 — Illustrations Checklist

Elements	*Identification*
Volumes	Arabic numerals — 1, 2, 3
Parts	Spell out in numerical sequence — Part One, Part Two, Part Three
Chapters	Arabic numerals in sequence — Chapter 1, Chapter 2, Chapter 3
Pages	Sequential Arabic numerals — 1, 2, 3
Sections	Capital letters in alphabetical order — Section A, Section B, throughout publication or within each chapter
Lessons	Arabic numerals in sequence after the 0 — Lesson 01, Lesson 02, … , Lesson 12, throughout the publication.
Main Paragraphs	Arabic numerals in sequence — 1, 2, 3
Subparagraphs	a, b, c, for first indention (After z, use aa, ab, ac.) (1), (2), (3) for second indention (a), (b), (c), for third indention
Attachments	Arabic numerals — Attachment 1, Attachment 2, in sequence
Figures	Arabic numerals — Figure 1, Figure 2, consecutively in publications without chapters Within chapters, use two-part Arabic numerals. (The first number identifies the chapter; the second, the figure sequence within the chapter. For example, Figure 1-1, Figure 1-2, Figure 1-3, for figures in Chapter 1; and Figure 2-1, Figure 2-2, Figure 2-3, for figures in Chapter 2.) In attachments, use two-part Arabic numerals, preceded by an “A.” (The letter “A” identifies the figure as being in an attachment; the first number identifies the attachment and the second number, the figure sequence within the attachment. For example, Figure A1-1, Figure A1-2, for figures in Attachment 1; and Figure A2-1, Figure A2-2, for figures in Attachment 2.)

Figure 4-2 — Organizational Elements of Publications

Research

1. Check indexes in the "0" series for related publications.
2. Search background files for pending information.
3. Verify publication numbers and supersession statement.
4. Verify references, abbreviations, symbols and addresses.
5. Check forms referenced. Are form titles included the first time they're mentioned?
6. Is a new publication needed? Can it be combined with another publication?
7. Ensure distribution block is appropriate and current.
8. Check DITIS database for existing or previously-developed CAI or CBT lessons.

Check English Standards

1. Is the manuscript written in the active voice with a plain, uncluttered style?
2. Does it contain clearly-constructed sentences that average no more than 15 words and contain simple, familiar words, instead of abstract or unnecessary technical words and jargon?
3. Does it avoid illogical and inconsistent shifts in the point of view (tense, person or voice) within a paragraph?
4. Does it present material in a logical, orderly sequence with each paragraph limited to one topic?
5. Does it use as many main paragraphs as possible, instead of drawn-out subparagraphs?
6. Does it contain clear descriptive titles for lessons, units, chapters, sections and paragraphs?
7. Are terms, illustrations and titles in good taste?
8. Are plural or sex-neutral terms used when possible?
9. Have you standardized all terms and definitions?

Editing

1. Are all pages accounted for and numbered correctly?
2. Is medium (regulation, pamphlet, supplement, change) proper for text?
3. Is the format correct?
4. Are subject series title and number in agreement?
5. Does the title accurately describe the text?
6. Does purpose statement explain the content?
7. If a contents page is used, does it match the text exactly?
8. Is purpose page complete and correct (supersession, pages, OPR, approval line, editor, distribution)?
9. Are paragraphs in sequence and do all headings and sub-headings describe the text exactly?
10. Have you edited text for spelling, grammar, punctuation and capitalization? Were you consistent in style and use?
11. Are illustrations identified, labeled and placed appropriately in text? Can they be reproduced?
12. Have you coordinated your corrections with your branch chief?

Figure 4-3 — Draft Checklist

Chapter 5

General Instructions

Introduction

This chapter provides guidance for all AETC flying training specialized publications. If you use the standard styles as you type the draft, formatting is much easier.

Format Preparation

Templates

The file server contains templates for the examples in the next eight chapters. The following documents are available: *Syllabus, Exam, IG, SG, EW, Change, Checklist* and *Coord Cycle.* These templates open as untitled copies of the original, so you must save them on your hard drive, using new file names. ***Don't*** save your documents using the original file names.

Computer Setup

The templates already contain the correct default parameters and use picas as the measurement system.

Cover page

Adapt the standard covers to your own requirements. One cover page is for single-line titles and another is for titles requiring two lines. ***Don't*** use more than two lines for your title. To preserve the proper spacing between lines, highlight and change only one line at a time.

Pages

Format Setup — Use double columns with the following parameters (Figures 5-1 and 5-2):

Inside Margin	—	7 picas
Outside Margin	—	4 picas
Top Margin	—	5 picas
Bottom Margin	—	6 picas
No. of Columns	—	2
Gutter	—	2 picas
Column Width	—	19 picas

Font — Times New Roman.

Chapter Heading	—	14-point, **bold**
Text	—	10-point, normal (**bold** or *italics* as required)

Page Numbering — On the *master pages*, a horizontal guideline 2p2 from the top and a vertical guideline coincident with the outside margin line is provided. The automatic page numbering feature is placed with the top and side against these lines. The numbers are now centered between the top of the page and the top margin. All pages will be numbered consecutively in Times New Roman 10-pt **bold**, with odd numbers in the top right corner of right-hand pages and even numbers in the top left corner of left-hand pages.

Styles — If you use the templates when beginning a new document, the "styles" are incorporated in the examples. If you have an existing file, you can copy these styles from the templates into your document. Click the insertion point and select a style from the palette. Your text takes on the appearance and parameters of that style. The following are examples of the most frequently used styles:

Heading 1

Heading 2

Heading 3

Heading 4

Heading 5

1. Text 1.

   a. Text a.

      (1) Text (1)

         (a) Text (a)

Text 1. is most frequently used as a normal paragraph. Numbering at the beginning is optional.

Use "Caption" to label figures.

master guideline at 2p2

top margin
= 5 picas

Lesson Number — Hours

(1p0 spacing provided by style “Heading 1”)

Lesson Title

(1p0 spacing provided by style “Heading 1”)

guideline at 10 picas

This example is a right-hand page, identified by an odd page number. The inside margin is nearest the binding or staples. The outside margin is toward the open side of the book, opposite the binding or staples. If the page number is odd, the inside margin is to the left and the outside margin is to the right.

inside margin
= 7 picas

column width = 19 picas

gutter
= 2
picas

outside margin
= 4 picas

column width = 19 picas

Figure 5-1 — Document Setup with Title

bottom margin
= 6 picas

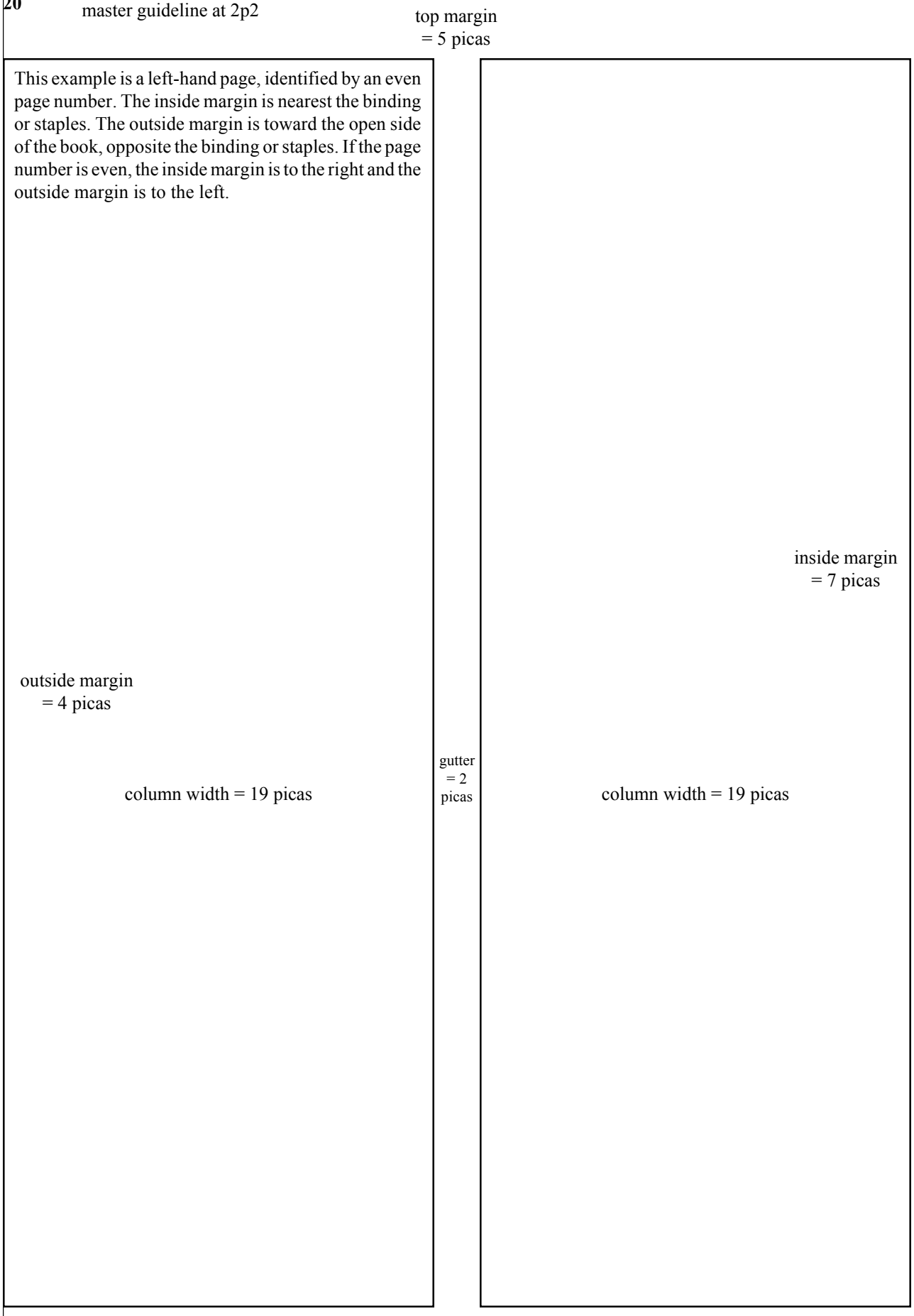


Figure 5-2 — Full-Page Setup without Title

Chapter 6

Syllabus

Introduction

This chapter provides direction and reference to plan, organize, write and format AETC flying training syllabuses.

Format Preparation

Example syllabus pages are available as templates. Use the templates to create a new syllabus or copy the styles into an existing document to ensure a standard format. Chapter 5 contains the standard setup parameters.

Cover Page

Refer to Figure 6-1 and adapt the standard cover page template to your specific course. The cover page must be centered.

(1) Document number (if applicable) — (12-pt, **bold**) Add the AETC prefix only to publications approved by HQ AETC and published for formal courses.

(2) Syllabus — 14-pt

(3) Title — (24-pt, **bold**) Limit title to two lines. For spacing considerations, different templates are provided for one- and two-line titles.

(4) Date — (14-pt) Enter month and year when publication will be available.

(5) AETC shield

(6) Originating organization — (14-pt) Use AETC only for training publications approved by HQ AETC and published for formal courses.

(7) Designed for AETC Course Use — 12-pt

Purpose Page

Print the purpose page (Figure 6-2) inside the front cover.

Heading — Place the Department of the Air Force heading in the top left corner for HQ AETC approved publications.

Publication Identification — Place the publication document number in the top right corner.

Date — Place the publication date (same as on the cover page) in the top right corner under the publication identification.

Purpose Statement — provides an overview of syllabus intent and applicability, and identifies the office of primary responsibility (OPR).

Signature Block — Use the HQ AETC/DO signature block for syllabuses approved by HQ AETC.

Summary of Changes (optional) — Include significant changes such as additions, deletions, or changes in training. If you need more space, place the Summary of Changes after the table of contents.

Supersession Line — Supersede the previous publication and changes. The line is a one-inch long, in-line graphic above the supersession statement.

Pages — Count ***all*** pages, including the cover, purpose page, "**i**" pages and attachments. Don't number or count blank pages.

Office of Primary Responsibility (OPR) — The organization and individual writing the publication including rank, full name and DSN number.

Certifying Authority — usually the commander of the OPR's organization

Editor — Include the editor's full name.

Distribution — Coordinate the distribution block with the publications monitor. The OPR and the publications monitor determine the distribution locations and quantities.

Contents Page

Refer to Figure 6-3.

(1) Chapters — Number and title all chapters as shown.

(2) Sections — Order and title all sections in Chapter 2 as indicated. Sections in the remaining chapters may vary, but should follow the example.

(3) Topics — Topics contained in each section may vary, but should reflect the template order when included.

Course Description

Refer to Figures 6-4 and 6-5. Include the information contained in the example. The format for course information (items 7 and 8) is left to the OPR's discretion. However, all device training events, simulator events, aircraft events, and academic courses must be included and presented in an easily interpreted format.

Course Administration

Refer to Figure 6-6 for a typical course administration page. Interpretation, waiver and deviation procedures must be included.

Commander's Review Process

If an elimination process is included, follow the example in Figure 6-7. If not, then reference all applicable instructions.

Syllabus page

Figure 6-8 depicts a sample syllabus page. Follow this style when presenting syllabus text.

Course Training Standards (CTS)

Course training standards should be included in the syllabus. If they are contained in a separate publication, reference the CTS in syllabus Chapter 2.

Figures 6-9 and 6-10 show the format for course training standards. Use a three-column format for performance, conditions and standards. The two-column format may be used if the conditions are very repetitive or redundant. Specify the conditions following the course training standard identifier. The "standards" column should be substantive, so include actual tolerances and avoid simply referencing another document.

Academic Training

Refer to Figure 6-11. The format is optional, but the academic listing must include the following:

1. Every academic lesson
2. Lesson number
3. Lesson description
4. Medium
5. Duration

Category Instructions

Refer to Figure 6-12 and list all category-specific special requirements

Maneuver Item File (MIF)

Refer to Figure 6-13. The mission requirement table format is optional. All required maneuvers must be included and referenced to the appropriate course training standard.

Prerequisites

You may use a prerequisite table (Figure 6-14), flowchart (Figure 6-15), or both. The information must be readily understandable and usable.

Bibliography

The syllabus doesn't require a bibliography, but if you include one, follow the example in Figure 6-16. The bibliography should include all instructions, manuals, technical orders, handouts, and student guides necessary for students to complete the course and enhance their training.

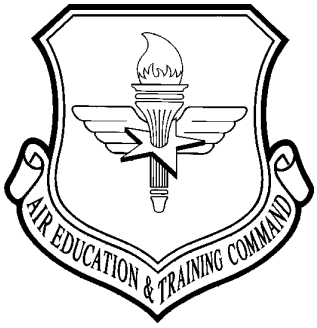
Glossary

If you include a glossary, follow the example in Figure 6-17. The OPR determines which abbreviations, acronyms and terms to include in the glossary.

Flying Training (2)

T-1A Pilot Instructor Training (3)

March 1999 (4)



(5)

Air Education and Training Command (6)

Figure 6-1 — Syllabus Cover Page

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4325

AETC Syllabus F-V5A-E

March 1999

This syllabus outlines the training required to achieve the proficiency specified in the course training standards. It prescribes the course content, instructions to conduct the training, and the approximate time necessary to successfully complete all requirements. Any training not specifically authorized in this syllabus or other AETC directives is prohibited without prior approval of this headquarters. Forward suggestions to HQ AETC/DOFI, 1 F STREET STE 2, RANDOLPH AFB TX 78150-4325. The next planned revision is March 2001.

OFFICIAL

WILLIAM WELSER III
Major General, USAF
Director of Operations

Summary of Changes

This change updates the distribution list, adds topic 1, Course Length, to Chapter 2, Section B, adjusts Figure 1 to more accurately reflect the Pilot Instructor Training elimination process, and makes T3190 a prerequisite for M3001.

Supersedes AETC Syllabus F-V5A-E, June 1996
Pages: 45
OPR: HQ AETC/DOFX (Maj John J. Jones, DSN 487-1234)
Certified by: Col Terence L. Gilbert
Editor: Mr. John P. Fosdick
DISTRIBUTION: X
AETC ACTIVITIES:
Randolph ..... EF
AFSAT/SDS 1
AFSAT/XO 1
AETC/DOFI 1
AETC/FMA 1
AETC/HO 2
AETC/SEF 1
AETC/SGT 1
AETC TRSS/CCQA ..... EF
AETC/XPRF 1
AETC/XPRR 1
19 AF/DO 1
12 OSS/OSTS ..... EF
12 FTW/HO 2
12 OG/OGV 2
14 OSS/OSTB, Columbus AFB MS 39710-4001 ..... EF
47 OSS/OSTD, Laughlin AFB TX 78843-5222 ..... EF
71 OSS/OST, Vance AFB OK 73705-5202 ..... EF
80 OSS/DOOB, Sheppard AFB TX 76311-2056 2
97 AMW/DOT, Altus AFB OK 73523-5053 1
AUL/LSAD, Maxwell AFB AL 36112-6424 1
OTHER ACTIVITIES:
HQ USAF/XOFM, 1480 Air Force Pentagon, Washington DC 20330-1480 2
HQ ANGRC/DOT, 3500 Fetchet Ave, Andrews AFB MD 20331-5157 2
HQ ACC/DOT, 205 Dodd Blvd Ste 101, Langley AFB VA 23665-2789 2
HQ AMC/DOT, 402 Scott Dr Unit 3C1, Scott AFB IL 62225-5302 2
8 AF/DOT, 245 Davis Ave E Rm 246, Barksdale AFB LA 71110-2279 2
9 BS/DO, 965 Ave D2, Dyess AFB TX 79607-1915 2
11 BS/DO, 339 Lindbergh, Barksdale AFB LA 71110-2054 2
20 BS/DO, 525 Lindbergh W Rm 104, Barksdale AFB LA 71110-2095 2
23 BS/DO, 300 Summit Dr, Minot AFB ND 58705-5047 2
28 BS/DO, 966 Ave A3, Dyess AFB TX 79607-1796 2
37 BS/DO, 1681 McConnell Blvd Ste 1, Ellsworth AFB SD 57706-4873 2
45 AS, 706 Chappie James Ste 102 Keesler AFB MS 39534-2608 1
50 TS/DOT, 2345 Cottonwood Dr Ste 100, USAF Academy CO 80840-6300 2
96 BS/DO, 315 Lindbergh E, Barksdale AFB LA 71110-3212 2
DET 14, ACC TRSS, 966 Ave A3, Dyess AFB TX 79607-1745 2
Office on Educational Credit for the American Council on Education, 1 Dupont Circle NW, Washington DC 20036 2
CNATRA/N-3, 250 Lexington Blvd Ste 1 NAS Corpus Christi TX 78419-5000 2
COMTRAWING SIX, 390 San Carlos Rd Ste C Pensacola FL 32508-5509 1
MDASCO, 925 Coronado Blvd Ste 215 Universal City TX 78148 1

Figure 6-2 — Syllabus Purpose Page

Contents

Figure 6-3 — Syllabus Contents Page

Chapter 1

Course Description

1. Course Title — T-1A Pilot Instructor Training (PIT)

2. Course Number — F-V5A-E

3. Course Objective — Qualify rated pilots as T-1A instructor pilots (IPs)

4. Location — Randolph AFB TX, or in-unit when approved by the gaining MAJCOM/DOT.

5. Duration — 72 training days

6. Course Entry Prerequisites — Completion of UPT Phase 2 (T-37 or T-6)

7. Status Upon Graduation — Graduates of this course are awarded an AF Form 1256, Certificate of Training, in accordance with the ETCA (http://hq2af.keesler.af.mil/etca.htm).

8. Device/Flying Training

a. ***T96 Simulator***	***Unit***	***Sorties/Hrs***
	T20XX	2/2.6
	T21XX	5/6.5
	E23XX	2/2.6
	E24XX	2/2.6
	M20XX	1/1.3
	Total	12/15.6

b. ***T-1A Aircraft***	***Unit***	***Sorties/Hrs***
	T30XX	8/12.0
	T40XX	7/10.5
	N30XX	3/4.5
	N31XX	2/3.0
	N40XX	4/6.0
	N41XX	4/6.0
	M30XX	5/7.5
	M31XX	5/7.5
	M32XX	4/6.0
Qualification Evaluation	T3190	1/1.5
Mission Evaluation	M3390	2/3.0
	Total	45/67.5

Notes

1. TXXXX units denote transition sorties; EXXXX units denote emergency procedures sorties; NXXXX units denote navigation sorties; and MXXXX units denote mission familiarization sorties.

2. PIT students may occupy either seat during training missions. Mission evaluation will be flown from the seat most appropriate for their planned mission qualification (i.e., PIT IP vs. JSUPT IP).

Figure 6-4 — Course Description

8. Ground Training

Academic Training	*Hours*
Advanced Aerodynamics (AA)	3.3
Advanced Instruments (AI)	3.6
Aerodynamics (AE)	11.1
Airdrop (AD)	2.3
Air Refueling (AR)	3.3
Cockpit/Crew Resource Management (CR)	7.6
Enroute Navigation (EN)	4.8
Formation (FO)	2.1
Ground Training (GT)	5.3
Life Support (LS)	3.0
Local Procedures (LP)	2.0
Low-Level Navigation (LL)	7.8
Instructor Development (ID)	13.3
Systems (SY)	49.7
Transition (TR)	10.4
IRC/Instrument Examination	9.0
Qualification Examination (Open and Closed Book)	6.0
Total	144.6

Notes

1. Students will attend an Instrument Refresher Course (IRC) prior to accomplishing the Instrument Examination (T1190).

2. Students will accomplish all Life Support, Transition and Systems academics prior to the Qualification Examination (T1090).

3. Students who have graduated from an AETC PIT course and instructed students in AETC during the last 5 years are not required to attend ID-01 or ID-02 (certify pass these students in the TMS). All students will attend ID-03 through ID-06.

4. The squadron life support officer will conduct Life Support (LS) training IAW AETCI 11-301.

Figure 6-5 — Course Description (cont'd)

Chapter 2

Course Administration

Section A — Syllabus Management

1. Syllabus Interpretation — This syllabus is directive and will be followed as written. If no clear syllabus guidance exists, resolve the situation using the appropriate wing chain of command. If the logical course of action appears to conflict with other directives, the OG Stan/Eval should contact the OPR, HQ AETC/DOF_ , at DSN 487-XXXX.

2. Syllabus Waiver — An approved syllabus waiver is required for any *planned* exception to the syllabus caused by special or unusual circumstances. Permanent or blanket waivers are *not* authorized, but should be suggested as syllabus changes. Submit waiver requests electronically or in writing, on AETC Form 6, *Waiver Request,* to the following approval authorities:

a. Syllabus waivers: through 19 AF/DO_ to 19 AF/DO.

b. Syllabus entry prerequisite waivers: through 19 AF/DO_ and 19 AF/DO, to HQ AETC/DOF.

c. Senior officer syllabus and entry prerequisite waivers: through 19 AF/DO_ , 19 AF/DO, and HQ AETC/DOF, to HQ AETC/DO.

Do not accomplish or omit any training requested in a waiver until notification of approval. Maintain a permanent record of all approved waivers in the students' gradebooks.

3. Syllabus Deviation — A syllabus deviation is any *unplanned* variation from syllabus requirements such as prerequisite flow, turn times, landing currency, or MIF requirements. Document *all* syllabus deviations in the student's gradebook.

All syllabus-directed training must be accomplished unless a waiver request is approved. If unforeseen circumstances result in an omission of required training, the OG/CC will determine if the omitted training can be accomplished later in the syllabus flow without adversely affecting the quality of student training. Document OG/CC-directed corrective actions, and the accomplishment of the omitted training in the student's gradebook.

4. Incomplete Training — Rated officers who voluntarily disenroll from this course may meet a Flying Evaluation Board (FEB), as directed by AFI 11-402 and AETC Sup 1. For active duty rated officers attending an AETC formal flying training course, AETC/CC is the final approval authority for all FEB actions. Enlisted students who voluntarily disenroll will be processed in accordance with AFI 11-402.

5. In-Unit Course Completion — Unless specifically authorized in this syllabus, students who are enrolled in a formal course will not complete training "in-unit" without an approved syllabus waiver as described in paragraph 2. In addition, a restricted AF Form 8 may be issued depending upon training completed at the FTU.

Section B — Training Management

1. Training Requirements and Restrictions

a. *Course Length* — This course is divided into two phases and will be accomplished in 72 training days:

(1) Academic Phase — 12 training days

(2) Flightline Phase — 60 training days

b. *Minimum Hour Requirement* — There is no minimum hour requirement for PIT graduation.

c. *Instructor Responsibilities* — Students are required to monitor their training and develop their mission profiles. However, flight commanders and IPs are responsible for training accomplishment.

d. *Events Per Day* — Students will not accomplish more than two syllabus events per day (aircraft/simulator). The exception is an incomplete sortie caused by an air abort or weather divert that may not qualify as an "accomplished" event. The operations officer will assess the effect of an incomplete sortie on the student's ability to successfully complete two events that day.

Figure 6-6 — Course Administration

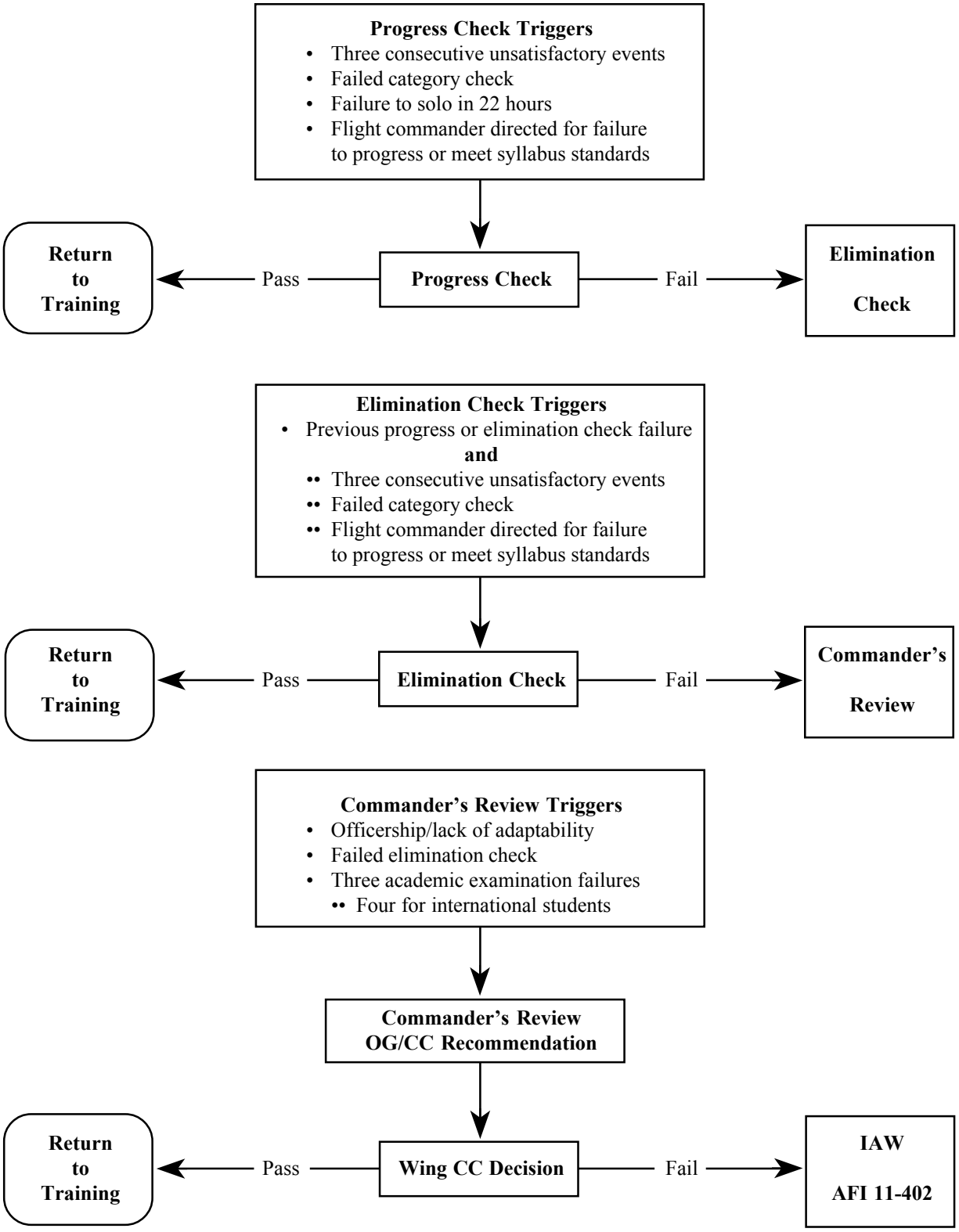


Figure 6-7 — Commander's Review Process

Section C — Grading Procedures

1. Maneuver Grading — Measure student performance against the course training standards. Grade each maneuver independent of overall performance or previous training received.

a. *Proficiency Maneuver Grades*

(1) **No Grade (NG, MIF level 1) —** Enter NG on the record of training when the maneuver is demonstrated by the instructor pilot but not practiced by the student.

(2) **Unable to Accomplish (U, MIF level 2) —** The student is unsafe or lacks sufficient knowledge, skill or ability to perform the operation, maneuver or task.

(3) **Fair (F, MIF level 3) —** The student performs the operation, maneuver or task safely but has limited proficiency. Deviations occur which detract from performance.

(4) **Good (G, MIF level 4) —** The student performs the operation, maneuver or task satisfactorily. Deviations occur which are recognized and corrected in a timely manner.

(5) **Excellent (E, MIF level 4) —** The student performs the operation, maneuver or task correctly, efficiently and skillfully. Minor deviations occur which do not detract from the overall performance.

b. *Instructional Maneuver Grades*

(1) Only give an instructional grade for a maneuver if one of the following conditions is met:

(a) The student gives instruction in the prebrief and the maneuver is accomplished during the sortie.

(b) The student gives instruction while the maneuver is being accomplished.

(c) During the debrief the student gives instruction on maneuvers accomplished during the sortie.

(2) Grade the instruction given based on the following scale:

(a) **No Grade (NG, MIF level 1) —** Enter NG on the record of training when instruction of the maneuver is demonstrated by the IP but not practiced by the student.

(b) **Unsatisfactory (U, MIF level 2) —** Instruction is inappropriate or wrong; the student fails to intervene as the IP.

(c) **Fair (F, MIF level 3) —** Although the student offers instruction, some noncritical items are omitted; student is slow to intervene as the IP.

(d) **Good (G, MIF level 4) —** The student offers appropriate instruction; timely intervention as the IP.

(e) **Excellent (E, MIF level 4) —** The student offers a high standard of instruction; active and appropriate intervention as the IP.

2. Overall Lesson Grade — After grading individual maneuvers, the IP will rate the student's overall performance and determine if, on the basis of training received, the grade for the mission is Excellent, Good, Fair or Unsatisfactory. An overall Good or Excellent may be appropriate when individual grades of F (Fair) or U (Unable) are given for maneuvers new to the student. However, a student's performance is expected to improve during training and lack of progression will be reflected in the overall grade.

3. Maneuver Item File (MIF) — Maneuvers with a plus (+) will be accomplished in the unit of training. Maneuvers without a number will not be flown.

4. Maneuver Logging — When grading single-engine precision, single-engine nonprecision or no-gyro approach, the specific type of approach flown may also be graded at the instructor's discretion.

5. Tasks — The following tables of course training standards define the tasks:

Figure 6-8 — Syllabus Page

1. Basic Aircraft Control		
Performance	***Conditions***	***Standards***
a. Avoid hazards (other airborne objects, ground obstructions, terrain, and severe weather).	a. While operating aircraft on ground and inflight.	a. At all times.
b. Maintain aircraft control. ***Note*** — Maintaining aircraft control is keeping the aircraft within specified tolerances when performing climbs, descents, level-offs, level flight, and turns using 30 degrees of bank or less.	a. Day or night.	a. ±150 feet of desired altitude. b. ±10 KIAS of desired airspeed. c. ±5 degrees of desired heading. d. Maintain smooth/positive control consistent with flight conditions.
c. Perform and instruct inflight planning to include maintaining area orientation and remaining within area limits.	a. Working area commensurate with type of mission, within specified boundaries defined by VOR radials and DME, and/or ground references, and upper and lower altitude boundaries. b. Preplanned mission profile.	a. Remain within area boundaries with or without ground references. b. Able to adjust mission profile to comply with time/fuel limitations, weather, and area limits. c. Use assigned airspace in an efficient manner with minimum delay between maneuvers.
d. Complete checklist items.	a. Checklist available for reference. b. While controlling aircraft. ***Special*** a. Challenge and response format used on dual flights.	a. Complete all checklist items correctly and at proper point in mission.
2. Mission Planning/Ground Operations		
Performance	***Conditions***	***Standards***
a. Perform and instruct appropriate mission planning to include computing takeoff, climb, enroute, descent, approach, and landing data; planning mission profile, and alternate course of action where appropriate. ***Special*** Receives ground training in mission planning covering alternate bases and diversion fuels/time.	a. Air navigation computer, plotter, appropriate forms, aeronautical charts (JNC, ONC, TPC), AF Forms 70, DD Forms 175 and 175-1. b. Access (in person or telephone link) to FAA or military weather briefing facility. c. Access to AFI 11-206, FLIP, NOTAMs, local instructions, syllabus, flight manual, and checklist.	a – c. Plan mission in a timely manner to meet maneuver requirements, complete all applicable Air Force and command forms correctly, and comply with all directives.
b. Inspect and wear personal equipment.	a. Appropriate personal equipment to include parachute, helmet, and oxygen mask, ear protection devices, and survival equipment. b. Personal equipment facility. c. Oxygen and intercom test equipment.	a – c. Correctly comply with appropriate directives.
c. Perform and instruct Preflight Check, Exterior Inspection, Interior Inspection, and Starting Engines checklists. Adhere to engine start and/or takeoff times within published tolerances.	a. Crew chief and fire extinguisher unit available. b. Aircraft/engine limitations memorized. c. Checklist and inflight guide available for reference during all inspections.	a. Determine aircraft status and accept or reject aircraft. b. Complete required checks correctly (comply with *Dash One* procedures and standardization tolerances).

Figure 6-9 — Course Training Standards (option A)

1. Basic Aircraft Control — governs the handling of the aircraft under all conditions not specifically covered by another course training standard.

Performance	*Standards*
Inflight operation of the aircraft.	a. Operate the aircraft IAW (1) Tech orders (*Dash One* and Performance Manual). (2) Training directives (AF, AETC and wing instructions and manuals). (3) FLIP and NOTAMs. b. Aircraft control is smooth and positive. c. Maintain ±5° of assigned heading. d. Maintain ±100 feet of assigned altitude. e. Maintain ±10 knots of tech order/assigned/briefed airspeed. f. Maintain arcs ±1 NM.

2. Mission Planning — begins when the student starts planning the assigned mission and ends when the student and IP depart for the aircraft.

Performance	*Standards*
All flight training categories.	a. Determine sortie requirements. b. Obtain required flight information. c. Plan mission profile to include alternate course of action if required. d. Complete required preflight documents. e. Plan and conduct formation and/or individual crew briefings. f. Complete all items in an accurate and timely manner.

3. Ground Operations — begins when departing for the aircraft and ends when power is applied for takeoff. Begins again when aircraft clears the runway and continues until power is advanced for a subsequent takeoff or when postflight duties are complete and the aircrew is clear of the aircraft.

Performance	*Standards*
All flight training categories.	a. IAW tech orders and training directives: (1) Determine status and accept or reject the aircraft. (2) Comply with ground servicing procedures. (3) Ensure proper ground operation of aircraft systems. (4) Ensure clearance of line personnel and ground equipment using appropriate signals before activating aircraft subsystems. (5) Taxi aircraft at speeds commensurate with traffic and surface conditions.

Figure 6-10 — Course Training Standards (option B)

Chapter 3

Academic Training

Unit	*Title*	*Medium*	*Hours*
AA	**Advanced Aerodynamics**		
AA-01	Stalls	IST	1.0
AA-02	Flight Phase Performance	IST	2.0
AA-98	AE/AA Critique	CAI	0.3
			3.3
AD	**Airdrop**		
AD-01	Airdrop Planning	IBT	1.0
AD-03	Airdrop Procedures	IBT	1.0
AD-98	Airdrop Critique	CAI	0.3
			2.3
AE	**Aerodynamics**		
AE-02	High-Speed Aerodynamics	IST	1.0
AE-03	Flight Characteristics	IST	1.0
AE-04	Weight and Balance	CAI	0.8
AE-05	Weight and Balance Lab	IBT	2.0
AE-06	Takeoff and Climb Performance	IST	1.3
AE-07	Takeoff and Climb Performance Lab	IBT	1.5
AE-08	Cruise, Descent and Landing Performance	IST	2.0
AE-09	Cruise, Descent and Landing Lab	IBT	1.5
			11.1
AI	**Advanced Instruments**		
AI-08	Approaches 1	IST	0.8
AI-11	Approaches 2	IST	0.8
AI-12	ICAO Procedures	CAI	1.0
AI-13	Jeppesen Approaches	IBT	1.0
			3.6
AR	**Air Refueling**		
AR-01	Air Refueling Planning	IBT	1.0
AR-03	Air Refueling Rendezvous Procedures	IBT	1.0
AR-04	Air Refueling Procedures	IBT	1.0
AR-98	Air Refueling Critique	CAI	0.3
			3.3

CAI — Computer-Assisted Instruction
IBT — Instructor-Based Training
IST — Individual Student Training

Figure 6-11 — Academic Training

Chapter 4

Flying Training

Section A — Emergency Procedures

Category Instructions

Syllabus simulator sorties will normally be scheduled in 3.0-hour blocks, 2.6 hours for training and 0.4 hours for seat swap and break.

Unit	*Title*	*Sorties*	*Medium*	*Hours*
E2301 – 02	**Basic Emergency Procedures**	2	T96	2.6

1. Emergency procedures will be flown part-task.

2. As a minimum, E2301 will include all **BOLDFACE** emergencies. E2302 will include a cross section of critical- and noncritical-action emergencies.

E2401 – 02	**Advanced Emergency Procedures**	2	T96	2.6

1. Emergency procedures will be flown mission profile.

2. The student will brief systems as assigned by the instructor.

3. With instructor assistance, the students will enter their grades into TMS.

4. As a minimum, E2401 will include all **BOLDFACE** emergencies. E2402 will include a cross section of critical- and noncritical-action emergencies.

Section B — Contact

Simulator

Unit	*Title*	*Sorties*	*Medium*	*Hours*
T2101 – 05	**Basic Aircraft Procedures**	5	T96	6.5

Aircraft

Unit	*Title*	*Sorties*	*Medium*	*Hours*
T3001 – 08	**Aircraft Proficiency**	8	T-1A	12.0

Figure 6-12 — Category Instructions

Navigation Maneuver Item File								
		Lesson Units/Sorties						
Man No	*Maneuver*	**N30/3**	**N40/4**		**N31/2**	**N41/4**	
		P	**P**	**I**	**P**	**P**	**I**
1	Mission Plan/Brief	3+	4+	4+	3+	4+	4+
2	Ground Operations	3+	4+	4+	3+	4+	4+
3	Takeoff	3+	4+	4+	3+	4+	4+
4	Departure	3+	4+	4+	3+	4+	4+
5	Level-Off	3+	4+	4+	3+	4+	4+
6	Enroute Procedures	3+	4+	4+	3+	4+	4+
7	Route Entry				3+	4+	4+
8	Map Reading	3+	4+	4+	3+	4+	4+
9	VFR Groundtrack Control	3+	4+	4+	3+	4+	4+
10	Route Corrections	3	4	4	3	4+	4+
11	Timing Corrections	3	4	4	3	4+	4+
12	Airdrop					2	2
13	Inflight Computations	3+	4+	4+	3+	4+	4+
14	Inflight Planning	3+	4+	4+	3+	4+	4+
15	Fix-to-Fix	3+	4+	4+	3	4	4
16	Holding	3+	4+	4+	3	4	4
17	Penetration	3	4	4	3	4	4
18	Enroute Descent	3+	4+	4+	3	4	4
19	Low-Altitude Approach	3+	4+	4+	3	4	4
20	ILS	3+	4+	4+	3	4	4
21	ILS Manual	3	4	4	3	4	4
22	Single-Engine Precision	3	4	4	3	4	4
23	PAR	3	4	4	3	4	4
24	No-Gyro Approach	3	4	4	3	4	4
25	ASR	3	4	4	3	4	4
26	TACAN	3	4	4	3	4	4
27	VOR	3	4	4	3	4	4
28	NDB	3+	4+	4+	3	4	4
29	Localizer	3+	4+	4+	3	4	4
30	Localizer Back Course	3	4	4	3	4	4
31	Single-Engine Nonprecision	3	4	4	3	4	4
32	Circling Approach	3	4+	4+	3	4	4
33	Missed Approach/Go-Around	3+	4+	4+	3	4	4
34	S/E Missed Approach/Go-Around	3	4	4	3	4	4
35	VFR Arrival	3+	4+	4+	3	4	4
36	Traffic Entry	3+	4+	4+	3	4+	4+
37	Tactical Overhead	3	4+	4+	3	4+	4+
38	30-Degree Flap Pattern	3	4	4	3	4	4
39	Landing	3+	4+	4+	3+	4+	4+
40	Single-Engine Pattern	3	4	4	3	4	4
41	Single-Engine Landing	3	4	4	3	4	4
42	10-Degree Flap Pattern	3	4	4	3	4	4
43	10-Degree Flap Landing	3	4	4	3	4	4
44	No-Flap Pattern	3	4	4	3	4	4
45	No-Flap Landing	3	4	4	3	4	4
46	Touch-and-Go	3	4	4	3	4	4
47	Closed Pattern	3	4	4	3	4	4

Figure 6-13 — Maneuver Item File

Chapter 5

General Instructions

Section A — Course Prerequisites

Simulator

Syllabus Event	*Prerequisite 1*	*2*	*3*	*Syllabus Event*	*Prerequisite 1*	*2*	*3*	*Syllabus Event*	*Prerequisite 1*	*2*	*3*
T1001	TR1-09	GB-03		T2203	T2202		T2302	T2301			
T2101	T1001	TR1-15		T2204	T2203		T2303	T2302			
T2201	T2101			T2205	T2204		T2401	T2303			
T2202	T2201			T2301	T3002		M2001	T4001	AR-04		

Aircraft

Syllabus Event	*Prerequisite 1*	*2*	*3*	*Syllabus Event*	*Prerequisite 1*	*2*	*3*	*Syllabus Event*	*Prerequisite 1*	*2*	*3*
T3001	T2201	PH-04		T4104	T4103			M3001	T4001	FO-03	
T3002	T3001			T4290	T4104			M3002	M3001		
T3003	T3002	T2203		N3001	T3102	EN2-14		M3101	M2001	M3002	
T3101	T3003			N3002	N3001			M3102	M3101		
T3102	T3101	T2303		N3003	N3002			M3201	N4101	M3002	AD-03
T3103	T3102			N3101	T3102	LL-04		M3202	M3201		
T3104	T3103	T2401		N3102	N3101			M4001	T4290	M3002	
T3105	T3104	N3102	N3003	N4001	T4290	N3003		M4002	M4001		
T3290*	T3105	T1090	T1190	N4002	N4001			M4003	M4002		
T4001	T3105	MI-06	CR-02	N4003	N4002			M4101	T4290	M3102	
T4002	T4001			N4004	N4003			M4102	M4101		
T4003	T4002			N4101	T4290	N3102		M4103	M4102		
T4101	T4003	MI-07		N4102	N4101			M4201	M4001	M3202	
T4102	T4101			N4103	N4102			M4202	M4201		
T4103	T4102			N4104	N4103	N4004		M4390	N4104	M4103	M4202

* Accomplished for proficiency-only pilots.

Figure 6-14 — Prerequisite Table (option A)

Chapter 5

General Instructions

Section A — Course Flow/Prerequisites

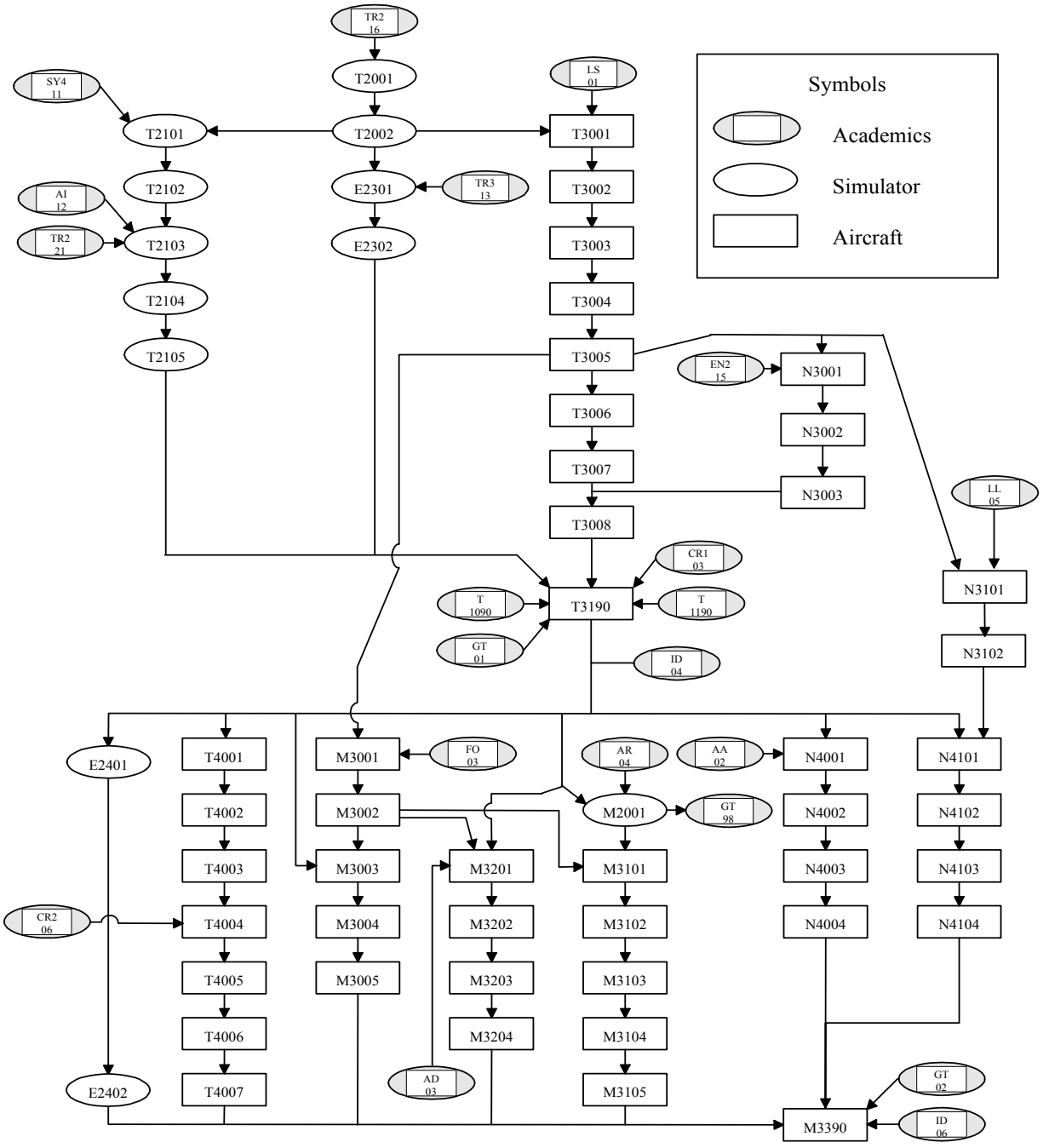


Figure 6-15 — Prerequisite Flowchart (option B)

Section B — Bibliography

1. ***Publications***	***Basis of Issue***
a. T.O. 1T-1A-1, *Flight Manual*	1/student
b. T.O. 1T-1A-1-1, *Performance Data*	1/student
c. T.O. 1T-1A-1CL-1, *Pilot's Abbreviated Flight Crew Checklist*	1/student
d. AFI 11-206, *General Flight Rules*	1/student
e. AFI 40-502, *The Weight and Body Fat Management Program*	1/flight
e. AFMAN 11-217, Vol 1 and Vol 2, *Instrument Flight Procedures*	1/student
f. AETCP 51-16, *Navigation for Pilot Training*	1/flight
g. AETCP 60-11, *MQB*	1/student
h. WGI 11-201, Vol 1, *Flying Training Administration*	1/student
i. WGI 11-201, Vol 4, *T-1A Operations*	1/student
j. WGI 11-201, Vol 7, *PIT Management*	1/student
k. WGI 11-201, Vol 14, *T-1A Inflight Guide*	1/student
l. AETC Syllabus P-V4A-G, JSUPT Syllabus	1/student
m. AETCI 11-202, *T-1A Aircrew Operational Procedures*	1/student
n. AETCMAN 11-203, *T-1A Aircrew Procedures*	1/student
o. AETCI 36-2205, *Flying Training Student Administration and Management*	1/flight
p. AETC HO, *T-1A Techniques and EP Guide*	1/student
2. ***Student Guides***	
a. *Advanced Aerodynamics*	1/student
b. *Advanced Instruments*	1/student
c. *Aerodynamics*	1/student
d. *Airdrop*	1/student
e. *Air Refueling*	1/student
f. *Basic Instruments*	1/student
g. *Cockpit/Crew Resource Management*	1/student
h. *Enroute Navigation*	1/student
i. *Formation*	1/student
j. *Low-Level Navigation*	1/student
k. *Instructor Development*	1/student
k. *Physiology*	1/student
l. *T-1A Systems*	1/student
m. *T-1A Transition*	1/student

Figure 6-16 — Syllabus Bibliography

Section C — Glossary

Additional Training Sorties (Coded 87) — Additional sorties given for extended breaks in training, for additional training directed by a flight examiner resulting from a failed flight examination, as a result of commander's review process, or for other reasons specified in the syllabus.

Category of Training — All training of a particular type (Transition, Formation etc.). The category of a particular lesson is identified by the first letter of the unit or lesson designator (e.g., N3001 is in the navigation category).

Commander's Awareness Program (CAP) — A management system used to increase supervisory attention on students displaying substandard performance. Refer to AETCI 36-2205 for further guidance.

Commander's Awareness Program Report — A computer report showing the names of students placed on CAP for any reason and the results of their last eight flightline activities and academic examinations.

Course Training Standards (CTS) — The training standards describing the skills and degree of proficiency required of the graduates of this course.

Elimination Check (EC) — A special flight check (coded 89) given to evaluate skill level and potential to complete training. It is used to determine if a student should continue in training or be recommended for elimination.

Flight Evaluation — AF Form 8 flight evaluation administered by a flight examiner.

Flying Evaluation Board (FEB) — A group of rated officers appointed to examine a rated officer's professional qualification for aviation service, evaluate potential for future rated duties, and make recommendations to higher authorities.

Maneuver Item File (MIF) — A computer-generated listing of all maneuvers, and the proficiency required in each maneuver, for all lessons in this course.

Media of Training — The media of training for this course are ground, simulator and aircraft.

Operational Review Report — A daily report that identifies students who have displayed a substandard level of performance but who are not on CAP. The purpose of the report is to assist commanders in identifying students for possible CAP. Students will appear on the report for the following reasons:

a. One of the last four lessons was a PC
b. The average of the last four graded aircraft/simulator lessons is fair or less
c. The student fails a progress check
d. Academic failure

Proficiency Advancement — Advancement based on the student's satisfactory achievement of unit objectives prior to the end of the unit.

Progress Check (PC) — A special check (coded 88) given to determine if a student should either continue in training or be recommended for an elimination check.

Sortie — An aircraft or simulator sortie begins at takeoff and ends at the closeout time documented in the AFTO Form 781. One sortie may encompass more than one syllabus event (see *Syllabus Event*).

Student Activity Record (AETC Form 803A or Wing Standardized Equivalent) — A form included in the gradebook used to record IP/supervisor comments concerning student training.

Syllabus Change — A permanent change to the syllabus. Syllabus changes must be approved by HQ AETC/DO.

Syllabus Deviation — Any noncompliance with the syllabus training plan not specifically permitted by a waiver.

Syllabus Event — Any individual academic, simulator or flying event, accomplished and graded complete. Normally two syllabus events are accomplished during each 3.0-hour aircraft sortie or 2.6-hour simulator sortie.

Training Forecast Schedule (TFS) — The TMS master syllabus with the training calendar superimposed. Reflects event line information as well as specific dates to accomplish syllabus lessons.

Unit — A group of lessons in any category with the same first two numbers in the lesson designator and the same list of maneuvers and objectives.

Figure 6-17 — Syllabus Glossary

Chapter 7

Examinations

Introduction

Criterion testing determines attainment of your objectives. This chapter explains these principles.

Information

Criterion Examinations

Follow these guidelines when writing examinations.

Exam Planning — Use the syllabus and CTS for performance, standards and conditions as defined in the objectives. Valid test questions track directly from the objectives. Deciding what to test is easy if the performance, conditions and standards of the objectives are properly written. Here's an example:

Objective — Given a drawing of a skeleton, name 50 bones within 20 minutes.

Test Question — On a drawing of a skeleton with all bones numbered, write the correct name for each bone on a form with only a list of numbers. You must name 50 bones within 20 minutes to pass the examination.

Exam question types — Most UFT written examinations are multiple-choice. Avoid writing true/false questions.

Written test validity — Exam questions must directly relate to objectives, and objectives must directly relate to job performance; however, it's difficult to relate written tests directly to job performance. Usually, written tests relate to job knowledge and memory skills.

Compare each objective to the corresponding test question. Specify what's provided to the student.

1. Objectives in the student guide generally describe the type of questions needed to test the objectives. Any additional items required must also be noted.

2. Decide how the test will be scored.

Avoid using absolute words such as always, never, only, and without fail.

Keep all alternatives relatively equal in length.

Ensure a direct relationship between the objectives and examination questions.

1. The question requires the student to produce the exact performance required.

2. Avoid ambiguous questions and don't play tricks on the students.

3. The conditions required to observe the performance in the test must be the same as in the objective.

4. Score the questions according to the standard required by the objective.

Use the following to clearly communicate the questions to the student:

1. Ensure each question tests only one objective.

2. Keep the language simple and consider using graphs, drawings and photographs when necessary.

3. Tell the students whether speed or accuracy is more important. Are there any time limits?

4. The best format has the shortest reading time and the greatest clarity.

5. Include any instructions common to all questions in the general exam instructions.

6. Ensure any conditions stated in the objectives are reflected in the exam.

7. Don't use negative or double negative wording.

8. Try to avoid "None of the above" as a response.

9. Don't write a question that depends on the answer from a previous question. Make each question independent. One question should not reveal the answer to another. The solution to a question should not depend upon correct performance on another question.

Multiple-Choice Questions

Questions must be brief and clearly stated. The students should know exactly what is expected before reading the responses.

Incorrect

Which of the following is best? Learning sets are …

Correct

Which of the following represents an example of a learning set?

Construct incorrect responses (distractors) that may be plausible to students with different information or

misinformation. You can derive these from actual wrong answers given by students in class and from your knowledge of common misconceptions. A distractor may include any of the following:

a. A response which relates to the situation and sounds plausible but is incorrect.

b. A common misconception.

c. A statement that is true in itself but does not satisfy the requirements of the problem.

d. A statement that is either too broad or narrow for the requirements of the problem.

Example

The third phase in the ISD Model is

a. develop objective training methods.

b. develop objectives and tests.

c. conduct evaluation tests.

d. implement evaluation and validation.

Repeat the units of measurement in all choices even when the units are specified in the question. Numbers alone don't communicate a complete unit.

How many inches equal 1 foot?

a. 10 inches

b. 12 inches

c. 15 inches

d. 18 inches

Align numbers in the choices at the decimal point.

a. .02 amps and 2 tons

b. .20 amps and 20 tons

c. 2.00 amps and 200 tons

d. 20.00 amps and 2,000 tons

Closed-stem questions are troublesome when lowercase abbreviations are used to begin one or more of the possible answers. For example, if one of the choices is "psi only," should the first letter be capitalized in accordance with the convention that the first letter of choices after a complete-sentence question be capitalized? If the first letter of the abbreviation is capitalized, e.g., Psi for psi, PH for pH, the abbreviation is incorrect. In such cases, use an open-stem format:

Cylinder pressure should be measured in

a. psi only.

or rephrase the closed stem.

In what units should cylinder pressure be recorded?

a. In psi only

When writing the responses, be grammatically correct and parallel in content.

Incorrect

No content parallelism

The man who succeeded Lincoln to the Presidency was

a. a former Senator.

b. from the South.

c. the 12th President of the United States.

d. Andrew Johnson.

Correct

The man who succeeded Lincoln to the Presidency was

a. James Buchanan.

b. Stephen Douglas.

c. Ulysses S. Grant

d. Andrew Johnson.

List responses containing numbers in descending or ascending order.

Incorrect

On the Fahrenheit thermometer, water freezes at

a. 10 °F.

b. 64 °F.

c. 32 °F.

d. 0 °F.

Correct

On the Fahrenheit thermometer, water freezes at

a. 0 °F.

b. 10 °F.

c. 32 °F.

d. 64 °F.

Format Preparation

Cover page

Refer to Figure 7-1 and adapt the AETC Standard Examination Cover in *Exam* of *Cover Pages*. Include the following information:

1. Materials needed to take the exam
2. Instructions for filling out and marking the answer sheet
3. Time allotted to complete the exam
4. Instructions to follow after completion

Center **Air Education and Training Command** and **Examination Instruction Sheet** at the top of the page in 14-point, **boldface**.

Include the examination identification number, date, and booklet number (actual number is handwritten after the examination is printed) in the top right corner. Place **Controlled Document** and **Do Not Mark on Examination Booklet** at the bottom of this page.

The reverse side of the cover page has **Controlled Document** and a statement prohibiting any unauthorized reproduction of examination material. These statements are in **boldface** and centered on the page (Figure 7-2).

Questions

Pages — Center the examination identification, without reference to the version number, at the top of all question pages (Figure 7-3). Beginning on the first question page, number the pages consecutively at the bottom center in **boldface**. Print the statements **Controlled Document** and **Do Not Mark On Examination Booklet** directly above the page number.

Special Instructions — If special instructions are needed for a specific question or a group of questions, list these instructions in **boldface** above the related question(s).

Figures — Number and caption all figures. Whenever possible, place figures on the same page as the question(s) they relate to. If a figure is too large to include on the same page, place it on the next page or at the end of the examination. Number these figure pages consecutively with the rest of the pages. If the above methods won't work for your examination, you may combine figures into a supplement.

Changes — When you change an examination, refer to the change only on the page where it occurs (Figure 7-3). Identify the change with (C1), (C2) placed next to the page number. Do not place the usual ★ or vertical bar by the question(s) or answer(s) where the change occurs.

Answer Key

List all the answers to the questions and each objective reference in numerical order (Figure 7-4). The following information is also included on the answer key:

1. Edition — The date of the test
2. Minimum Passing Score
3. Version — The examination identification plus the version number
4. Change(s) — Enter "None" if there are none. Publish a new answer key with every formal or write-in change. This block reflects changes to the examination, not the answer key.
5. **Controlled Document** statement centered at the bottom of the page

Examination: WX0890

Date: March 1999

Booklet Number: _____

Air Education and Training Command

Examination Instruction Sheet

1. You need the items listed below to complete this examination:

   Answer Sheet — Pencil
   Scratch Paper — DR Kit

2. Enter the following information in the proper blanks on your answer sheet:

   Last Name, First Name, Middle Initial
   Student Number
   Effective Date — (Date of Testing)
   Class Designation
   Lesson Identity — (Examination Identifier)
   Number of Questions
   Retake — If Applicable
   Instructor
   Examination Booklet Number

3. **Do Not Mark On This Examination Booklet.**

4. Select the **Best** answer to each question and mark your choice **Clearly** and **Distinctly** in the proper space on your answer sheet.

5. If you change your mind about an answer after marking it, **Erase** your old mark **Completely** and then mark your new answer.

6. If **No Choice** is made for a question or if **Multiple Choices** are marked for one question, that question will be scored as incorrect.

7. You are allowed **90 Minutes** to complete this examination.

8. After completing the examination, turn in your booklet, answer sheet and scratch paper at the place designated by the instructor and **Quietly** leave the room.

9. **Discussing this Examination Outside the Classroom is a Compromise of Security and is Strictly Prohibited.**

10. The minimum passing grade is 85 percent or **43** of **50** questions correct. You will be notified of your grade as soon as possible.

Controlled Document
Do Not Mark On Examination Booklet

Figure 7-1 — Examination Cover Page

*** * Controlled Document * ***

Figure 7-2 — Examination Controlled Document Page

AA0090

1. What is the minimum continuous level-flight airspeed (lock point)?
   a. 142 KTAS
   b. 151 KTAS
   c. 181 KTAS
   d. 184 KTAS

Use the L/D_{max} diagram (Figure 4) at the end of this examination to answer question 2.

2. What is L/D_{max} airspeed?
   a. 105 KTAS
   b. 128 KTAS
   c. 132 KTAS
   d. 210 KTAS

3. If all other variable are considered normal, which of the following statements concerning T-38 aerodynamic braking is correct?
   a. Aerobraking should be used to the maximum extent possible during any abort above 100 KIAS.
   b. Aerobraking is appropriate only if it is possible to obtain the optimum pitch attitude and configuration.
   c. Aerobraking during a high-speed abort is not recommended.
   d. All the above are correct.

4. Which of the following statements concerning T-38 spin characteristics is correct?
   a. The aircraft is most susceptible to spin entry during high-airspeed, high-G maneuvers.
   b. The aircraft tends to spin with the outside wing low and the nose below the horizon.
   c. The primary anti-spin control for the T-38 is the aileron.
   d. None of the above is correct.

5. How does a level acceleration from 300 KIAS to 400 KIAS affect aircraft energy?
   a. Potential energy increases and total energy remains unchanged.
   b. Kinetic energy decreases and total energy increases.
   c. Both potential energy and kinetic energy increase.
   d. Both a and b are correct.

Controlled Document
Do Not Mark On Examination Booklet

1 (C1)

Figure 7-3 — Examination Question Page

SUPT Academics

T-38 Applied Aerodynamics

Answer Key

Edition: March 1999
Version: AA 95-1
Change(s): None

Minimum Passing Score: 43 of 50

	Answer	*Objective*		*Answer*	*Objective*
1.	b	(1-1)	26.	a	(9-2)
2.	d	(1-2)	27.	d	(9-3)
3.	a	(2-1)	28.	a	(9-4)
4.	d	(2-1)	29.	b	(9-5)
5.	c	(2-2)	30.	c	(9-6)
6.	d	(3-2)	31.	d	(10-1)
7.	a	(3-2)	32.	a	(10-2)
8.	b	(3-3)	33.	b	(10-3)
9.	c	(3-3)	34.	c	(11-1)
10.	c	(3-4)	35.	d	(11-2)
11.	a	(4-1)	36.	a	(11-3)
12.	c	(4-2)	37.	b	(11-4)
13.	d	(4-2)	38.	c	(12-3)
14.	d	(5-3)	39.	d	(12-3)
15.	a	(5-3)	40.	a	(12-4)
16.	d	(6-3)	41.	b	(12-5)
17.	b	(6-4)	42.	c	(13-1)
18.	c	(6-6)	43.	d	(13-2)
19.	a	(6-6)	44.	a	(13-3)
20.	d	(6-6)	45.	b	(13-4)
21.	a	(7-1)	46.	c	(14-1)
22.	b	(7-2)	47.	d	(14-2)
23.	b	(7-2)	48.	a	(14-3)
24.	c	(8-1)	49.	b	(15-1)
25.	d	(8-2)	50.	c	(15-2)

Controlled Document

Figure 7-4 — Examination Answer Key

Chapter 8

Instructor Guide

Introduction

This chapter provides guidance for writing an instructor guide (IG). When prepared and used correctly, an IG assures effective instruction by providing lesson continuity and standard presentations.

Format Preparation

Cover page

Refer to Figure 8-1 and adapt the AETC Standard Cover in *IG* of *Cover Pages*.

Purpose Page

Print the purpose page (Figure 8-2) inside the front cover. The purpose statement establishes requirements applying to all instructors or students. A purpose page has the following items:

Heading — Place the Department of the Air Force heading in the top left corner.

Publication Identification — Place the publication document number in the top right corner.

Date — Place the publication effective date (same as on the cover page) in the top right corner under the publication identification.

Purpose Paragraph — Use the purpose statement in Figure 8-2. You may change it slightly to state special requirements.

Signature Block — Use the AETC/DO signature block for AETC instructor guides.

Summary of Changes — Include significant changes such as additions, deletions, or changes in training. If you need more space, place the Summary of Changes after the table of contents.

Supersession Line — Supersede the previous publication and changes. The line is a one-inch long, inline graphic.

Pages — Omit the page count until the publication is in its final form. Then count ***all*** pages, including the cover, purpose page, "**i**" pages and attachments.

Office of Primary Responsibility (OPR) — The organization writing the publication and the TPM's rank, full name, and DSN number

Approving Authority — AETC TRSS/CC

Editor — The editor's full name.

Distribution — Coordinate the distribution block with the publications monitor. The OPR and the publications monitor determine the distribution locations and quantities.

Contents Page

Include the exact title of each part, lesson, section and attachment. Do not list figures contained in attachments. Refer to Figures 8-3 and 8-4 and use the following guidelines:

1. Number the contents page beginning with "**i**" in the top right corner.
2. List the lesson reference numbers.
3. Specify the medium.
4. List the lesson titles.
5. List the first page number for each lesson.
6. List the hours for each lesson.
7. List the total hours for the course at the bottom.

Special Instructions page

Special instructions may include precautions, equipment scheduling, safety, individual welfare, CAI, or special instructions on the planned use of training resources. The information should be essential and not obvious from other information in the instructional outline (Figure 8-5).

IG Pages

Chapter Heading — (Style "Heading 1") Center the lesson reference number and hours as shown in Figure 8-6. Add the lesson title on the second line. Use the identical title as you did on the contents page.

Objectives or Goals — List all objectives or goals at the beginning of the lesson under the heading **Objective(s)** or **Goal(s)**.

Restate the objectives or goals identically within the applicable lesson, unless only one objective is given. When repeating objectives, place them as follows:

1. Above the first main heading when the objective is taught in two or more main headings.
2. Under the main heading (before the outline begins) when the objective is taught in two or more subheadings.
3. Under the subheading (before the outline begins) when the objective is taught solely under that subheading (Figure 8-7).

When an IG lists objectives covered in a CAI program, ensure the wording of the CAI objectives is identical to the IG objectives.

Instructional Aids — Identify slides as 35mm (Figure 8-6). Include the total number of slides in parentheses. Identify audiovisual aids by number and title. A playback or projection device is implied and does not need to be listed.

List only instructional materials used in class by the instructor or students to accomplish the lesson objectives. Additional instructional materials used solely by the instructor may be referenced on the special instructions page or under the references. Identify SGs, CLs, HOs, manuals and other items by number and title. Identify commercial texts by title only. List the authors only if texts have the same titles.

References — List publications under this heading when they are only used outside the classroom. If a publication is used in the classroom, it is listed as an instructional aid (Figure 8-6). This heading is optional.

Training Equipment — List the equipment required to accomplish the objectives for each lesson of instruction. Identify by type and model designations. Do not use stock numbers unless needed for clarity. This heading is optional (Figure 8-6).

Notes Column — This **boldface** subheading is centered and placed only on the first page of each lesson, opposite **Objective(s)** or **Goal(s)** heading. Entries in this column include audiovisual aids such as slides, films and learning center lessons, by number and title. Slides are labeled by course, lesson and number. For example, the third slide in the fifth lesson of T-38 Systems would be labeled SO-05-03. You may also use this column for course notes from the TPM to the instructor, such as changes in teaching methods, student exercises or directions for audiovisual aids (Figure 8-6). List training aids opposite the objective they apply to. These notes to the instructor provide more guidance to support the objective.

Instruction — Under this heading, instructors can introduce themselves, the course or lesson content, gain the students' attention, motivate them, review past instructional material and preview the course or lesson. Although all the *subheadings* (introduction, attention and motivation, review, and preview) under this heading are *mandatory*, you don't need to add written material (Figures 8-6 and 8-7).

1. **Introduction** — This section allows instructors to establish common ground with their students. The TPM may offer some suggestions or leave it blank so the instructor can personalize it.

2. **Attention and Motivation** — Use this section to gain attention, make a personal appeal to the students and reinforce their desire to learn.

3. **Review** — This section allows the instructor to review past information and smoothly transition into the present lesson.

4. **Preview** — This section provides an overview of what will be covered during the class period. The key items under this heading become the main headings and subheadings in the teaching outline.

Information — The text under this heading presents new material in an outline format (Figures 8-7). The points of your outline become the topic and paragraph headings for the material in the student guide.

Summary — This heading provides a place for the instructor to reinforce learning by restating the main points of the lesson objectives (Figure 8-7).

1. Interim — Short or interim knowledge-level summaries may be appropriate within a lesson, for example, after one or more main headings are introduced.

2. Final — This summary follows after all the main headings are introduced.

Assignment — Use this heading at the end of each lesson and at the beginning of the next lesson, following the **Objective** list (Figure 8-7). Since some lessons in the IG include CAI lessons prerequisite or supplementary to the lesson, they must be listed under the assignment heading in both locations. If there is no assignment, omit this heading.

Course Review Pages

These pages provide an opportunity to reinforce learning by reviewing the main points and objectives previously covered. The review pages remind the instructor to review both classroom and CAI lessons (Figure 8-8).

The first line on the review page is the lesson number and the time for review. Next is the course title and the word **Review**.

Examination and Critique Page

The examination and critique page includes examination number, time allotted, the course title, and the words **Examination and Critique** (Figure 8-9).

CAI Page

Figure 8-10 illustrates the format for CAI lessons.

Flying Training

T-38 Applied Aerodynamics

March 1999

Air Education and Training Command

Designed for AETC Course Use

Figure 8-1 — IG Cover Page

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4404

AETC Instructor Guide P-V4A-B-AA-IG

March 1999

The instructor guide (IG) is an outline of instruction. Academic instructors will personalize this IG and develop their lesson plan. The IG contains objectives, lesson sequence, instructional aids required, and other guidance to prepare and conduct training. It also includes the recommended sequence of instruction within each lesson. Academic instructors may adjust only the sequence of instruction within each lesson. Other deviations from the IG, such as deleting instructional aids or adjusting overall lesson sequence, require approval of the AETC Training Support Squadron. Address questions or recommendations for course improvement to AETC TRSS/IDX, 1150 5TH STREET EAST STE 2, RANDOLPH AFB TX 78150-4404. The next planned revision is March 2002.

OFFICIAL

WILLIAM WELSER III
Major General, USAF
Director of Operations

Summary of Changes

This revision updates the distribution list, adds topic 1, Course Length, to Chapter 2, Section B, adjusts Figure 1 to more accurately reflect the Pilot Instructor Training elimination process, and makes T3190 a prerequisite for M3001.

Note — All locations under "other activities" require complete street addresses as listed in AFDIR 37-135, *Air Force Address Directory*.

Supersedes AETC Instructor Guide P-V4A-B-AA-IG, March 1996
Pages: 100
OPR: AETC TRSS/IDX (Capt John J. Jones, DSN 487-1234)
Approved by: Lt Col Russell B. Kline
Editor: Mr. John P. Fosdick
DISTRIBUTION: X
AETC ACTIVITIES:
Randolph ..... EF
AETC TRSS/CCQA ..... EF
12 OSS/OSTS ..... EF
12 OG/OGV 2
14 OSS/OSTB, Columbus AFB MS 39710-4001 ..... EF
47 OSS/OSTD, Laughlin AFB TX 78843-5222 ..... EF
71 OSS/OST, Vance AFB OK 73705-5202 ..... EF
80 OSS/DOOB, Sheppard AFB TX 76311-2056 2
AUL/LSAD, Maxwell AFB AL 36112-6424 1
OTHER ACTIVITIES:
50 TS/DOT, 2345 Cottonwood Dr Ste 100,
USAF Academy CO 80840-6300 1
CNATRA/N-3, 250 Lexington Blvd Ste 1,
NAS Corpus Christi TX 78419-5000 1

Figure 8-2 — IG Purpose Page

Contents

Figure 8-3 — IG Contents Page (Single Medium)

Contents

CAI — Computer-Assisted Instruction

CR — Classroom

Figure 8-4 — IG Contents Page (Multiple Media)

T-38 Systems

Special Instructions

To the Instructor

1. Develop a lesson plan from this instructor guide. This instructor guide is an outline on how to conduct the classes, the training aids to use and assignments to give. The **Notes** column contains audiovisual prompts. Each prompt is keyed to a specific portion of the material to enhance your presentation. During the course introduction, discuss the student guide and how to use it. The current UPT syllabus lists all other training aids.

2. Accomplish the following before class:

   a. Become familiar with the instructor guide (IG), student guide (SG) and the *Systems Analysis/Emergency Procedures* (EP) guide.

   b. Prepare training aids for use.

   c. Ensure each student has an SG, an EP guide, a pen or pencil, and a checklist.

   d. Refer to training aids and slides as indicated in the instructor guide.

   e. At the end of the course, instruct students to keep the SG and EP guide for future reference.

3. At the beginning of Lesson 01, complete the following items:

   a. Briefly introduce each unit of instruction.

   b. Inform students that the objectives at the beginning of each unit in the SG are sequenced to follow the instruction.

   c. Have the students complete the exercise portion of their SG *prior* to class.

   d. Issue the *Systems Analysis/Emergency Procedures Guide* before the first hour of instruction and have the students look it over. Tell them you will refer to the guide frequently in class and they will be required to reference it for home study assignments throughout the course.

Figure 8-5 — IG Special Instructions Page

Lesson 05 — 3.0 Hours

Navigation

Objectives

1. Identify the operating characteristics, indications and limitations of the
   a. Tactical Air Navigation (TACAN) system.
   b. Instrument Landing System (ILS).
2. Recognize the parts of the flight director system display as labeled in Section I of the *Dash One.*
3. Identify the operating characteristics of the
   a. AAU-19/A altimeter.
   b. ADI.
   c. airspeed/Mach indicator.
   d. AOA system.

Assignment

1. Read Lesson 05, Navigation Equipment, in the SG.
2. Read Section 4, Communication and Navigation Equipment, and Section 9 of the *Dash One*.
3. Read Chapter 4, Section E of AFMAN 11-212.
4. Answer the review questions in Lesson 05 in the SG.

Instructional Aids

1. 35mm slides (38)
2. AFMAN 11-212, Chapters 1, 2, 4 and 7

References

Use this heading when applicable; otherwise, omit.

Training Equipment

ADI/HSI T-38 Demonstrator (optional)

Instruction

Notes

1. Introduction

   Show Slide S0-05-01
   Navigation Equipment

2. Attention and motivation

3. Review

Figure 8-6 — IG Page

4. Preview — Show Slide S0-05-02 *Preview*

   a. TACAN, ILS equipment

   b. Flight director system

   c. Control and performance instruments

Information

TACAN and ILS Equipment

Objective 1 — Identify the operating characteristics, indications and limitations of the following systems:

   a. Tactical Air Navigation (TACAN)

   b. Instrument Landing System (ILS)

1. TACAN operation — Instrument Mock-Up

   a. TACAN is UHF, line of sight.

   b. Ground and airborne equipment contain receivers and transmitters. Requires AC and DC power. — Show Slide S0-05-02 *TACAN*

   c. Station identifies itself aurally with Morse code every 35 seconds. No identifier means maintenance is being performed or the signal is unreliable.

   d. Airspeed marker with set knob allows setting an airspeed reference on takeoff and final approach. — ***Note*** — Discuss the use of indicated Mach number for lead points.

2. AOA system

   a. AOA vane (de-iced with pitot heat) — ❶ ❷ ❸ ❹ ❺ ❻ — AOA Vane — 04

   b. Cockpit displays — ❻ — AOA Indicator — 05

      (1) Final approach — ❶❷❸❹❺❻ — Final Approach — 06

      (2) Stall

      (3) Maximum range and maximum endurance

Summary

1. TACAN, ILS equipment —  — Summary — 06

2. Flight director system

3. Flight director control panel

Assignment

1. Read Lesson 06, Aircraft Fuel System, in the Student Guide.

2. Answer the review questions in Lesson 06.

3. Read Section 1 in the *Dash One* (Fuel System).

Figure 8-7 — IG Page (cont'd)

Lesson 10 — 2.0 Hours

Flight Regulations Review

Objective

Using all objectives from Flight Regulations, review course content and answer questions in preparation for the Flight Regulations examination.

Notes

Assignment

1. Review CFR01 through CFR09.
2. Complete all workbook exercises before class.
3. Bring AFMs 51-40 and AFMAN 11-217 to class.

References

1. CFR IG
2. CFR SG

Instruction

1. Introduction

2. Attention and motivation

3. Review and preview are not required.

Information

This entire lesson is devoted to a review of the objectives of Flight Regulations.

Summary

(May be omitted at the instructor's option)

Assignment

Tell students to bring their TO 1T-43A-1-2 and TO 1T-43A-1-2CL-1 to the examination.

Figure 8-8 — IG Course Review Page

Lesson 95 — 4.0 Hours

Basic Procedures Examination and Critique

Goals

1. Complete the Basic Procedures examination in the allotted time and within the academic standard.
2. Critique all errors on the examination to 100 percent.

Assignment

Review CBP lessons in preparation for this examination.

Special Instructions

Administer this examination using the guidelines in the Examination and Critique chapter.

Instructional Aids

1. Examination and answer sheets for each student
2. Examination package

Instruction

1. Introduction
2. Attention and motivation
3. Review — Answer any last minute questions.
4. Preview
   a. Examination
   b. Critique

Information

Basic Procedures Examination

Goal 1 — Complete the Basic Procedures examination in the allotted time within the academic standard.

Administer the examination IAW the Examination and Critique chapter.

Basic Procedures Examination Critique

Goal 2 — Critique all errors on the examination to 100 percent.

Notes

Have students complete AETC Form 736, *Student Critique*; then review, consolidate and send to AETC TRSS/IDX, Randolph AFB TX 78150-4404.

Figure 8-9 — IG Examination and Critique Page

Lesson 0702 — 1.5 Hours

FLIP Publications (Part 1)

Segment 1 — *FLIP* Planning Document

Objectives

Given *FLIP General Planning (GP)*, list the references given for terms in the Index for Aeronautical Information.

Given *FLIP General Planning (GP)*, identify the definitions of specific terms, abbreviations, and NOTAM codes.

Segment 2 — *IFR Supplement*

Objective

Given the *IFR Supplement*, extract information from the *Airport/Facility Directory* by referencing the legend.

Segment 3 — *Flight Information Handbook*

Objective

Given the *Flight Information Handbook (FIH)*, identify its contents and the location of information using the index of subjects.

Notes

Figure 8-10 — IG Page for CAI Lesson

Chapter 9

Student Guide

Introduction

The student guide (SG) contains subject information about the lessons. SGs supplement instructor presentations and help students learn the objectives. SGs present theories, facts and principles. They may also contain practice and review exercises to support lesson objectives.

Format Preparation

Cover page

Refer to Figure 9-1 and adapt the AETC Standard Cover in *SG* of *Cover Pages*. The only differences between the IG and SG covers are the identification name and number in the top right corner.

Purpose Page

Follow the purpose page guidance in Chapter 8 and refer to Figure 9-2 when preparing an SG purpose page.

Contents Page

Follow the contents page instructions in Chapter 8 and refer to Figure 9-3.

Special Instructions Page

A special instructions page is mandatory when CAI is part of your courseware (Figure 9-4). Include guidance for using CAI, directions on specific lessons, and instructions to follow if CAI equipment is inoperative.

If the course does not include CAI, a special instructions page is optional and may be added at the TPM's discretion.

SG Pages

Chapter Heading — (Style "Heading 1") Center the lesson reference number and hour(s) as shown in Figure 9-5. Add the lesson title on the second line. Use the identical title as you did on the contents page.

Objectives or Goals — List all objectives or goals at the beginning of the lesson under the heading **Objective(s)** or **Goal(s)**. SG objectives and goals must be identical to those in the IG. Restate the objectives or goals within the applicable lesson, unless only one objective is given. When repeating objectives, place them as follows:

1. Above the first main heading when the objective is taught in two or more main headings.

2. Under the main heading (before the outline begins) when the objective is taught in two or more subheadings.

3. Under the subheading (before the outline begins) when the objective is taught solely under that subheading

Assignment — Place this heading at the beginning of each lesson after **Objective(s)** or **Goal(s)**. List all the assigned supplemental readings (Figure 9-5). Since some lessons in the SG include CAI lessons as prerequisite or supplementary to the lesson, they must be listed under the assignment heading.

Introduction — The introduction to a lesson captures and holds attention, outlines the lesson and relates it to the complete course, and leads the students into the lesson content.

Keep the introduction brief and to the point. Stress the importance and practical use of the information in the SG. While humor may be tempting, the introduction should be free from irrelevant stories, jokes or incidents distracting from the lesson objectives (Figure 9-5).

Information — The text under this heading presents new material for students to learn. Use the following guidelines for an unnumbered division of text material within the information part of SGs:

1. **Headings — (Style "Heading 2")** Left-aligned, **boldface,** and 12-pt, for main topics (*Information*, Figure 9-5).

2. **Subheadings — (Style "Heading 3")** Centered, **boldface,** and 12-pt (*Hydraulic Power System*, Figure 9-5).

3. **Sub-Subheadings — (Style "Heading 3")** Left-aligned, **boldface,** 10-pt upper and lower case (*Utility Hydraulic System*, Figure 9-5).

4. **Sub-Sub-Subheadings** — Use **boldface** with upper and lower case, and continue the paragraph with normal text on the same line, separated by a thin space, em-dash, thin space. (*Speed Brake*, Figure 9-5)

Figures — Number figures consecutively within each lesson (Figure 9-6). If a figure is used, it *must* be referred to in the text. If a full page-width figure is used, place the text referring to it in double columns above the figure. Start the next topic under the full-width figure and use double columns.

Numbering Divisions — Numbering of SG text divisions is usually unnecessary. You may number them if the length or complexity of subject matter requires it for ease of reference and use. Follow the styles in Chapter 1.

Summary Heading — A summary heading and text is optional. A long SG may require a final summary or a short interim summary after each section or part (Figure 9-5).

Practice and Review Exercises — Refer to AFI 36-2201 & AFMAN 36-2234, *Instructional System Development*; AFH 36-2235, Vol 8, *Information for Designers of Instructional Systems (Application to Aircrew Training);* and AFMAN 36-2236, *Guidebook for Air Force Instructors,* for examples and guidelines on writing questions. Design realistic, thought-provoking questions to help students relate job requirements to the material.

When there is more than one practice exercise, number each exercise consecutively throughout the lesson and on the answer page. If a review exercise is used, place it at the end of the lesson and test a sample of all the material, to include questions from any practice exercises (Figures 9-7 and 9-8).

When writing questions for the SG, leave space for students to write their answers. Include any instructions how to complete the exercise and where to find the answers. Place the answer key for review exercises in an attachment at the end of the SG (Figure 9-9).

Joint Undergraduate Navigator/NFO Training

Advanced Electronic Warfare Officer Training

March 1999

Air Education and Training Command

Figure 9-1 — SG Cover Page

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4404

AETC Student Guide N-EG-EW-SG

March 1999

This student guide lists all the objectives for each unit of instruction in T-38 Applied Aerodynamics. These objectives identify what you need to learn. Develop an understanding of the material by answering the review questions at the end of each unit. These questions also provide an excellent review for the exam. The answers to these questions are in the back of this book. The next planned revision is March 2001.

OFFICIAL

WILLIAM WELSER III
Major General, USAF
Director of Operations

Note — All locations under "other activities" require complete street addresses as listed in AFDIR 37-135, *Air Force Address Directory*.

Supersedes AETC Student Guide N-EG-EW-SG, June 1993
Pages: 100
OPR: AETC TRSS/IDX (Capt John J. Jones, DSN 487-1234)
Approved by: Lt Col Russell B. Kline
Editor: Mr. John P. Fosdick
DISTRIBUTION: X
AETC ACTIVITIES:
Randolph ..... EF
AETC TRSS/CCQA ..... EF
12 OSS/OSTS ..... EF
12 OG/OGV 2
14 OSS/OSTB, Columbus AFB MS 39710-4001 ..... EF
47 OSS/OSTD, Laughlin AFB TX 78843-5222 ..... EF
71 OSS/OST, Vance AFB OK 73705-5202 ..... EF
80 OSS/DOOB, Sheppard AFB TX 76311-2056 2
AUL/LSAD, Maxwell AFB AL 36112-6424 1
OTHER ACTIVITIES:
50 TS/DOT, 2345 Cottonwood Dr Ste 100,
USAF Academy CO 80840-6300 1
CNATRA/N-3, 250 Lexington Blvd Ste 1,
NAS Corpus Christi TX 78419-5000 1

Figure 9-2 — SG Purpose Page

Contents

CAI — Computer-Assisted Instruction

CR — Classroom

Figure 9-3 — SG Contents Page

Special Instructions

This student guide, including assigned CAI lessons, is designed to qualify you as quickly as possible in T-38 systems. The material presented is pilot-oriented. You won't learn how to overhaul the J-85 engine, but you will learn enough about its operating characteristics to know if it's working right. Refer to the *Systems Analysis/Emergency Procedures Guide* for what to do if it's not working right. Finally, remember this student guide is only one part of the course. It is not designed to replace the *Dash One* or *Checklist*. Study these manuals for more technical, in-depth information and don't hesitate to ask questions.

Read the following sections before the corresponding CAI lesson:

Figure 9-4 — SG Special Instructions Page

Lesson AA1312 — 3.0 Hours

Flight Control and Hydraulic Systems

Objectives

1. Identify the purpose and operating characteristics of the following hydraulic system components:
    a. Hydraulic reservoir
    b. Hydraulic pump
    c. Pressure indicating system
2. Identify the operating characteristics of the flaps and flap-slab interconnect system.
3. Identify the operating characteristics of the following components:
    a. Speed brake
    b. Rudder limiter
    c. Wheel brake system
4. Select the flight conditions necessary to activate the landing gear warning system.

Assignment

1. Read AA1312 in the SG and answer the review questions.
2. Read Section 1 of the *Dash One* (Hydraulic Systems).
3. Review the hydraulic system emergencies in Section 3 of the *Dash One* and in the *Systems Analysis/Emergency Procedures Guide.*

Introduction

This lesson covers two topics: T-38 flight controls and T-38 hydraulic systems. We group these topics together since the hydraulic systems are fundamental to the operation of many flight controls. In fact, with both systems inoperative (zero hydraulic pressure), you'll have no control of the primary flight controls (ailerons, rudder and stabilator). The *Dash One* recommends ejection with dual hydraulic failure. In addition to the primary flight control surfaces, the hydraulics power several other systems. You'll use most of the systems every flight (nosewheel steering, landing gear, stability augmenter). This lesson, is divided into functional parts and includes the nonhydraulic flight controls (flaps and flap-slab interconnect system) for the complete picture.

Information

Hydraulic System

Objective 1 — Identify the purpose and operating characteristics of the following hydraulic system components:

a. Hydraulic reservoir
b. Hydraulic pump
c. Pressure indicating system

For increased dependability, efficiency and safety, the T-38 has two independent hydraulic systems, each operating at approximately 3,000 psi.

The flight control system operates only the flight controls and is powered by the right engine. The utility system operates the flight controls, normal gear extension and retraction, speed brake, nosewheel steering and the stability augmenter system, and is powered by the left engine.

Utility Hydraulic System

The hydraulic system pump is located on the left airframe mounted gearbox and powers an equal share of the flight controls. It also powers the speed brake, normal landing gear extension and retraction, nosewheel steering, and the stability augmenter system.

Speed Brake — The speed brake requires utility hydraulic and DC electrical power. Both cockpits have a three-position switch (UP-OFF-DOWN). The front switch has positive detents in each position, while the rear switch is spring loaded to the center "OFF" position.

Summary

In the T-38, the flight controls are hydraulically operated. Because of their critical role, the flight controls are powered by both the utility and flight control hydraulic systems. Other aircraft systems, such as the speed brake and landing gear, are also operated by the utility hydraulic system.

Figure 9-5 — SG Page

Always try to place a full page-width figure at the top or bottom of a page and your text in double columns above or below it. If your text only requires a few lines to explain a subject like the *Airport Facility Directory* (Figure 8-3) and you need to begin a new topic, but don't want to start a new page, skip to the area below the figure.

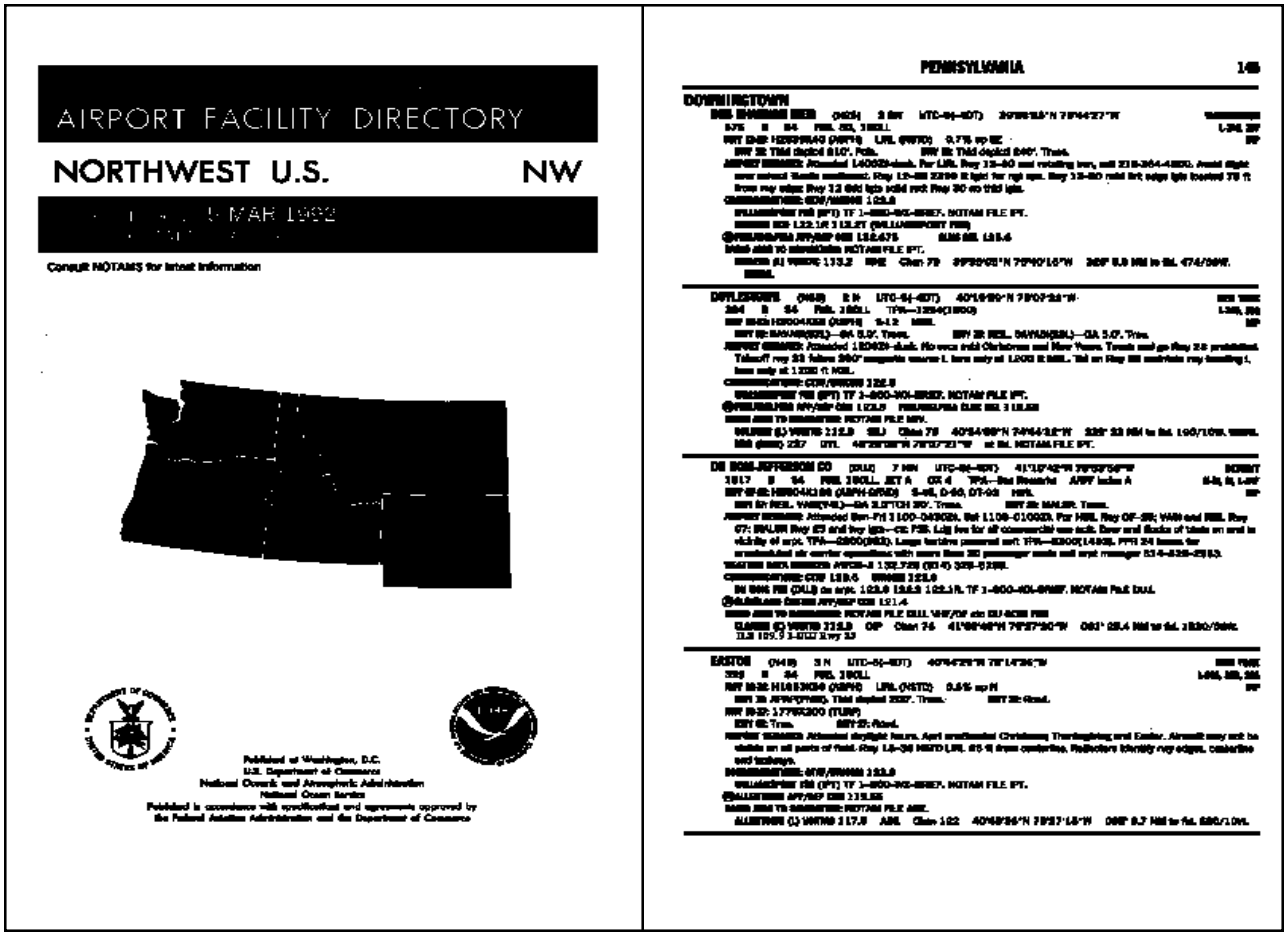


Figure 8-3 — Airport Facility Directory

Start your new topic here and continue in the double-column format. This technique may be useful if you want to avoid an additional page or a blank page at the end of a chapter.

Figure 9-6 — Full Page-Width Figure in Middle of Text

Exercise 1 — T-37 Fuel Systems

1. The inverted flight reservoir holds ____ seconds of fuel.
2. It may take up to ____ seconds for an engine at idle to stop running after pulling the fuel shutoff T-handle.
3. The engine-driven fuel pump supplies ____ -pressure fuel to the fuel control.
4. With total electrical failure, can you shut down an engine using the fuel shutoff T-handle?

//

1. 30 2. 10 3. high 4. No

Figure 9-7 — SG Practice Exercise

Review Exercise 08

Complete the following review exercise by choosing the correct response. Answers are in Attachment 1.

1. Can you maneuver the T-38 with the left engine seized and the right airframe mounted gearbox failed?
   a. Yes, but a landing cannot be made.
   b. No, immediate ejection is recommended.
   c. Yes, but a controlled ejection is recommended if not at a low altitude.
   d. Yes, but control pressures are directly proportionate to airflows over the control surfaces since the hydraulic boost is lost.

2. Identify the following as true or false regarding the T-38 hydraulic system.
   a. Nosewheel steering is available only with downside hydraulic pressure.
   b. Normal gear extension requires DC and utility hydraulic pressure.
   c. Speed brake requires DC and utility hydraulic pressure.
   d. Wing flaps require DC and utility hydraulic pressure.

3. Why does the T-38 aircraft have two hydraulic reservoirs?
   a. A reserve supply of hydraulic fluid is required.
   b. To allow for two independent hydraulic systems
   c. So one system can supply fluid to the other if the other gets low.
   d. All the above are correct.

4. Which of the following requires the stability augmenter system to be on?
   a. Aileron trim
   b. Rudder trim
   c. Stabilator trim
   d. All the above

Figure 9-8 — SG Review Exercises

Answers to Review Exercises

Review Exercise 01

1. d
2. b
3. b
4. a
5. c, d, e, f, h
6. a
7. b
8. a
9. b
10. a

Review Exercise 02

1. d
2. a
3. a
4. b, c
5. a
6. a
7. c
8. c
9. d
10. d
11. d
12. c

Review Exercise 03

1. a
2. b
3. b
4. d
5. c
6. e
7. c, d
8. a, d
9. d
10. b, d
11. off
12. T
13. b
14. a
15. c, d, e, g, i, j
16. a, c, d, f, g, h
17. b, c, d
18. d
19. a, c, d, f, g
20. d
21. d
22. b, c, d
23. Yes
24. AC, DC
25. 18
26. Is not, XFMR RECT OUT light blinks momentarily anytime DC bus voltage drops below the battery voltage. Common causes are flap actuation, fuel quantity check, and AB ignition.
27. d
28. a
29. d
30. d
31. b
32. a
33. a
34. c

Review Exercise 04

1. c
2. d
3. a
4. d
5. c
6. d
7. a
8. a
9. a
10. a
11. c
12. b
13. d

Review Exercise 05

1. a, c
2. b, c, d, e
3. b, c
4. a, c
5. a, b, d
6. b, d
7. See Flight Director System Display in SG.
8. See Flight Director System Display in SG.

Figure 9-9 — Answer Key Page for SG Review Exercises

Chapter 10

Checklist

Introduction

A checklist (CL) is an abbreviated reference of procedures or steps to follow when accomplishing specific tasks or objectives.

Format Preparation

Checklist pages are half size (33 × 51 picas), so the *Checklist* template in the *Cover Pages* folder is oriented horizontally, with two pages per sheet of paper.

Cover page

Refer to Figure 10-1 and adapt the AETC Standard Cover in *Checklist* of *Cover Pages*.

Purpose Page

Follow the procedures in Chapter 8 when you prepare the CL purpose page. Refer to Figure 8-2 for an example. Use "checklist" in the wording of the purpose statement.

Contents Page

The format of the contents page differs from the IG or SG contents page. There is no need for a lesson or hours column and the headings listed on the contents page are main subject headings instead of lesson headings (Figure 10-2).

Checklist Pages

Page Numbering — Follow the standard page numbering procedures.

Headings — Subject headings are listed consecutively instead of beginning on a new page (Figure 10-3).

CL Body — Prepare the remaining pages of the CL in a manner best suited to the objectives or missions the CL support.

Undergraduate Pilot Training

T51 Instrument Flight Simulator

March 1999

Air Education and Training Command

Designed for AETC Course Use

Figure 10-1 — Checklist Cover Page

i

Contents

Figure 10-2 — Checklist Contents Page

2

Cockpit Entry and Motion Consent

1. Gate — Locked
2. Cockpit platform — Free of loose items
3. Crew members — Strapped in
4. Canopy — Down and locked
5. CONTROL LOADING SWITCH — ON
6. Simulator — Freeze.
7. Aircraft sound volume and cockpit lighting — As desired
8. Coordinate motion consent with console operator.
9. MOTION CONSENT BUTTON — Depress and hold.
10. MOTION CONSENT BUTTON — Release when blinking begins.

Selecting Initial Conditions

1. Simulator — Freeze.
2. Configuration — Appropriate for desired IC

   Note — The console operator or the pilot can insert an IC. If you insert an IC from the cockpit, follow steps 3 through 5.
3. Rotary Knobs — Set.
4. INSERT/DELETE BUTTON — Depress.
5. FREEZE BUTTON — Depress to come off freeze after blinking stops.

   Note — If INSERT/DELETE light blinks, clear by resetting the knobs and repeat steps 1 through 5.

Figure 10-3 — CL Page

Chapter 11

Computer-Assisted Instruction (CAI)

Information

CAI augments classroom academic lessons because many concepts on CAI are presented better than in class. Don't confront students with distractions. They should not need to learn new keystrokes, use new input devices, or face unfamiliar lesson structure. All CAI lessons should have the same "look and feel." These guidelines will help you.

Good CAI focuses on the student's last response, creating a conversational and interactive exchange. Material is displayed on the screen, the system waits for the student to respond, and then reacts to that response. The student and the system bounce back and forth in an informal interaction. Good CAI lessons answer the student's next question and hold attention. Learning can be enjoyable, and to perpetuate the interaction, students need valid feedback for all possible responses. If a student receives weak feedback or a computer error message, it's not productive. Feedback is an opportunity to reinforce learning. If the student demonstrates a misconception, good feedback is the way to correct it.

The CAI development phase is not complicated. The following paragraphs discuss many aspects of CAI lesson design.

Course Consultation — Whether starting a new course, or modifying an existing one, meet with IDC representatives early. They can help you decide which objectives are best presented with CAI, and offer effective CAI techniques. Simply because an objective has been presented in the classroom or on CAI in the past, doesn't mean it can't be better presented in a different medium.

1. Mapping — Work with IDC to determine what degree of learner control the current CAI system can support. You may be unaware of a technique and overlook an opportunity to enhance your course.

2. Graphics — Find out what *is* and *is not* possible. You must know the graphic capabilities before you can plan your CAI development.

3. Branching — Know the system's branching capabilities. With student interaction, branching provides different paths through the same material. Incorrect responses can cause students to return to information already studied or to pages specially designed for further clarification.

Lesson Flow — All related lessons should have the same look and feel. Overlays can cause portions of the screen to be replaced by new material, creating a sense of flow in the lesson. Lesson flow should be controlled by the students, so give them as much control as possible over the material presentation rate. Avoid frames with time-outs; let the students decide when they are ready for more information. Some options giving control to the student include the following:

1. Choice of lesson sequence — If a lesson (or series of lessons) teaches six different parts of a system, and the order the students learn the parts makes no difference, then allow them to choose the order.

2. Back/Review — Allows students to reverse through previous displays to check what they saw or did.

3. Practice — Presents students with representative questions covering the material. Ideally the student may select as many practice tasks as desired. Feedback must be available for all possible responses.

4. Help — This option can be implemented at various levels of detail. Use it to tell students what their options are, or to provide specific information when needed. Help can be very powerful because the information is hidden until the user requests it.

5. Map — This option returns students to the last menu used to allow another selection.

Basic Screen Layout — The basic screen display of a CAI lesson must be easy to read, balanced, and uncluttered. Plan for much more open space than in printed material to give students a sense of freedom. Arrange areas of text into horizontally narrow blocks or windows, enabling students to use fewer eye spans.

1. Text Windows — Center the longest line of text in a window and left align the other lines with this one. If a series of text is overlaid in the same window, keep the same alignment.

2. Graphic Screens — Use a grid system for placing objects. Keep the main graphic in one place to focus lesson flow on the new information as you build a display.

3. Order — Display objects and text in a logical sequence. For example, when a student's input changes an existing graphic, reflect this change first, then display the appropriate text response. If a screen change is minor or subtle, use some form of highlighting to ensure the student notices.

4. Consistency — Keep screen layouts consistent. The format for questions and answers should be the same as all other similar ones. Feedback should appear in the same area of the screen.

Interactivity — Quality and quantity of interactivity for effective CAI is important. The *quantity* of interactivity may be sufficient (e.g., student presses "next" for each frame), but this action is clearly insufficient from the *quality* standpoint. Quality is defined by the level of thinking required when interacting. Quality requires problem-solving skills to progress through a lesson. Only psychomotor skills are required to press enter. Ideally, there is a mix of the types of thinking skills required in the interactivity. To design interactions, begin with the lesson objectives, and determine what the students must do to demonstrate mastery of those objectives. These activities form the key elements of lesson interactions. The best CAI lessons affirm learning through student experience. The students will not simply know, but *know* they know, and can *apply* the subject matter of the lesson. When constructing questions, carefully analyze possible student misconceptions and incorporate them into the distractors. Specify feedback for each answer to clear up misconceptions.

Prototype — Poor designs and bad content cause poor courseware. Design flaws cause costly revisions. When a lesson is coded on the computer, many elements must coincide, including content, instructional strategies, student control options, screen design, etc. It's difficult to focus on all these aspects simultaneously. First construct a prototype, so you can focus on one aspect at a time. Show the design to other OPRs. When the lesson feels right, put it on the computer to test it further. If possible, have an outside group test the prototype in addition to the target population members. When testing a lesson, check all special keys (RULE, HELP, EASY, etc.). Most unexpected responses are accidental, not deliberate, and are usually difficult to anticipate. For example, the student meant to press the shift key to type a capital "C" but instead pressed the control key and entered a "control C." On many systems, this command interrupts processing. Frequently, students press the enter or return key before they type their response, and may result in an incorrect answer. The prototype should demonstrate the design will work effectively before developing the entire lesson series.

Items to Avoid

True/False or Yes/No Questions — are really multiple choice questions in disguise (with only two alternatives). They do not provide a good measurement because the 50-percent odds tempt students to guess, rather than think.

More Than Two Frames of Solid Text in a Row — Break up with graphics, review questions, etc. If large quantities of text must be presented, provide supplemental printed material.

Time Delays — diminish student control. Slow readers, fast readers, and students who look away for a few seconds will all become frustrated.

Testing of Trivial Information — wastes resources and is probably insulting to students. A well designed program accurately measures if students accomplish the objectives. Just because students respond correctly to questions or accomplish tasks satisfactorily is no guarantee they've mastered the objectives. Valid test design is as important for CAI lessons as for other media.

Individual Segments Longer Than 30 Minutes — Video displays can be fatiguing and the law of diminishing returns applies. Longer segments are more difficult to design, develop, debug and update. Summaries of practice segments provide good transitions between sections of material, and a slight break for the student.

Long Sentences — Long sentences can create a cumbersome, inactive mood. Short sentences imply action and are easier to read on a computer screen.

Fake Flattery — Feedback to a correct answer such as, "you are one of my best students," is too personal for a computer. Unless such feedback is based on careful record keeping, it could be wrong. Keep feedback straightforward and accurate.

Sarcasm — This type of humor may work in interpersonal relations, but fails in CAI.

Overly Attractive Feedback for Wrong Answers — Some students may try to get wrong answers just to see this type of feedback. Mundane, but helpful feedback for wrong answers is better.

Nonrelevant Material — All material should support mastery of the knowledge and skills stated in the objectives.

Chapter 12

Revision and Change Procedures

Revisions

A revised publication supersedes the previous version. It has a new date and includes a supersession statement on the purpose page, for example, "Supersedes AETC Instructor Guide S-V8N-C-CFR-IG, July 1997." A revision automatically supersedes all changes to the previous version, including interim changes, unless otherwise specified.

A "Summary of Changes" statement is optional. It's valuable for those familiar with the superseded publication. Identify the revisions, deletions and additions by citing the section or lesson where they appear, and explain why the publication was revised. Place the summary on the purpose page between the signature element and the supersession line, after the Table of Contents, or on a separate Summary of Changes page.

★ Place a ★ (Wingdings, Alt+0171) in the nearest margin to show the lines containing revised material. If more than one line is changed, place a vertical bar (4 points wide) in the margin.

Changes

This section describes formal, interim, and specialized message changes to publications.

Formal Change

A formal change is a separate printed publication changing the contents of an existing publication (referred to as the basic publication). A formal change always identifies the publication being changed and is given the same distribution as the basic publication unless otherwise indicated (Figure 12-1).

Heading — The same heading as the basic publication.

Change Numbers — Place in the top right corner and number in sequence, for example C1, C2.

Publication Identification — The same as the basic publication except spell out Instructor Guide or Student Guide.

Date — The effective date of the change.

Change Title — The same as the basic publication title on the cover page.

Page-Insert — Holders of the basic publication receive a new page for each publication containing obsolete text or illustrations. Both sides of the page are included, even though only one side may contain changed material. At the top of *both sides* of the page identify the publication, the change number and date, in **boldface**, opposite the page number (Figure 12-2):

AETC S-V8N-C-CFR-IG(C1) July 1997 4-3

4-4 AETC S-V8N-C-CFR-IG(C1) July 1997

A ★ or bar indicates where the material has been changed. The page-insert method is more costly, but is preferred for many training publications. Basic publications changed this way are easier to read and understand than ones changed by the write-in method.

Write-In — Pages containing erroneous words, symbols, or phrases may be amended with write-in corrections. Use this method with restraint; writing in many corrections can take time.

Slide Insert — This method is authorized when slide changes are required.

Signature Block — The same as the basic training publication.

Footnotes — Show supersession if the change supersedes an earlier change; number of pages; OPR, if changed; and distribution.

Change Insert to the IG

When it's impractical to make a page-insert change to a student publication, the change can be made as a page supplement to the instructor guide. This type of change may be identified as either a *formal* change insert or an *interim* change insert. A change-insert has a lead line identifying the changed publication and directs the instructor to announce the write-in changes to the students. It also has a closing line directing the instructors to file a copy of the change-insert in the back of their instructor guide. The OPR determines distribution (Figure 12-3).

Specialized Message Change (SMC)

Use this method only when a formal change is not practical and when the information must meet an urgent requirement (Figure 12-4). Use an OCR font. SMCs are not announced in the AETC Publishing Bulletin, indexed in AETCR 0-5, or distributed and stocked by the Publication Distribution Center. Distribution of SMCs is limited and is the responsibility of the OPR. Send a copy to each activity requiring the information. Convert the SMC to a formal change *within 30 days*. On the formal change, the supersession line must state the SMC number and its date; for example, "Supersedes SMC 97-1, 31 Jan 97." Assign a number to each SMC, consisting of the last two digits of

the calendar year when it's issued, followed by a hyphen and a control number in sequence, such as 96-1, 97-1, 97-2. Do not reuse a number even if the change is superseded or rescinded.

Prepare SMCs in the following manner:

Format — Use the standard message format in Figure 12-4.

Distribution — Same as the basic publication, but limited.

Body of Message — Follow instructions for formal and interim changes. Exceptions are as follows:

1. Don't use a lead line.
2. Use a complete subject.
3. Don't use page inserts.

Signature Block — For AETC, the AETC TRSS Commander signs.

Filing Instructions

After posting formal, interim and SMCs, file the transmittal page in back of the basic publication. Reproduction of extra copies of interim changes and SMCs is limited and requires approval by the publication OPR.

Rescinding Instructions

Formal, interim and SMCs remain in effect until superseded or rescinded. If previous changes remain in effect, do not supersede or rescind them. Incorporate the contents in the next formal change or revision. Each interim or specialized message change superseded by a formal change must be cited in the current change's supersession statement.

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4404

CHANGE 2
AETC Instructor Guide P-V4A-AC-IG
March 1999

T-37 Aerodynamics

Change AETC Instructor Guide P-V4A-AC-IG, March 1997, as follows:

1. Page-Insert Changes — A vertical bar (**|**) or star (★) indicates new or revised material.

Remove	*Date*	*Insert*
11-1, 11-2	August 1990	11-1 (C2), 11-2 (C2)
15-1 through 15-3	August 1990	15-1 (C2)

2. Write-In Changes

Page	*Reference*	*Line*	*Action*
10-1	Objective 4	1	Change "Show Slide AC-03-14" to "Show Slide AC-03-14 (C2)"

3. Slide-Insert Changes

Remove	*Insert*
AC-03-14	AC-03-14 (C2)

4. Filing — After posting this change, file this page at the end of T-37 Aerodynamics IG, March 1997.

OFFICIAL

WILLIAM WELSER III
Major General, USAF
Director of Operations

Pages: 6
OPR: AETC TRSS/IDX (Capt John J. Jones, DSN 487-1234)
Approved by: Lt Col Russell B. Kline
Editor: Mr. John P. Fosdick
DISTRIBUTION: X

AETC ACTIVITIES:
Randolph ..... EF
AETC TRSS/CCQA ..... EF
19 AF/DO 1
12OSS/OSTS ..... EF
12 OG/OGV 2
14 OSS/OSTB, Columbus AFB MS 39701-4001 ..... EF
47 OSS/OSTD, Laughlin AFB TX 78843-5222 ..... EF
71 OSS/OST, Vance AFB OK 73705-5202 ..... EF
80 OSS/DOQB, Sheppard AFB TX 76311-2056 2
AUL/LSAD, Maxwell AFB AL 36112-6424 1
OTHER ACTIVITIES:
50 ATS, 2345 Cottonwood Dr Ste 100
USAF Academy CO 80840-6300 1
54 OSS/DOTT, 9212 Airfield Dr Ste 1
USAF Academy CO 80840-2025 1
CNATRA, Training Department, Bldg 1
NAS Corpus Christi TX 78419-5000 1

Figure 12-1 — Formal Change Transmittal Page

Lesson 09 — 1.0 Hours

Course Review

Notes

Objective

Review course objectives and materials to prepare for examination.

Instructional Aids

★ Practice problems as deemed necessary by the instructor.

Instruction

Stress active student participation and ensure all course objectives are accomplished.

Figure 12-2 — Page-Insert

DEPARTMENT OF THE AIR FORCE
Headquarters Air Education and Training Command
Randolph AFB TX 78150-4404

INTERIM CHANGE INSERT 1
AETC Instructor Guide P-V4A-AC-IG
March 1999

Applied Aerodynamics

Change AETC Student Guide P-V4A-A-AA-SG, March 1997, as follows:

1. The instructor will ensure the students make the following changes during AA0101.

2. **Write-In Changes**

Page	*Location*	*Action*
1-1	Assignment	Delete item 2; renumber 3 and 4 to 2 and 3.
1-2, 1-3	Problems 1c, 2b and 4c.	Delete the parenthetical statements "(MIL thrust)."
1-2	Problem 2b.	Change the given temperature to "15 degrees Celsius;"

3. The problems changed above can still be worked by the students. The instructor will use the following revised answer when correcting problem 2b:

2b	CFL	4,100 feet
	NACS	107 knots @ 1,000 feet
	MACS	97 knots @ 1,000 feet

4. **Filing**

Place a copy of this interim change at the end of each Applied Aerodynamics IG, March 1997.

OFFICIAL

WILLIAM WELSER III
Major General, USAF
Director of Operations

Pages: 1
DISTRIBUTION: X
AETC ACTIVITIES:
Randolph ..... EF
AETC TRSS/CCQA ..... EF
12 OSS/DOTSB ..... EF
12 OG/OGV 2
14 OSS/DOTBB, Columbus AFB MS 39710-4001 ..... EF
47 OSS/DOTBB, Laughlin AFB TX 78843-5222 ..... EF
71 OSS/DOTBB, Vance AFB OK 73705-5202 ..... EF
80 OSS/DOTSB, Sheppard AFB TX 76311-2056 2
AUL/LSAD, Maxwell AFB AL 36112-6424 1
OTHER ACTIVITIES:
50 ATS, 2345 Cottonwood Dr Ste 100
USAF Academy CO 80840-6300 1
54 OSS/DOTT, 9212 Airfield Dr Ste 1
USAF Academy CO 80840-2025 1
CNATRA, Training Department, Bldg 1
NAS Corpus Christi TX 78419-5000 1

Figure 12-3 — Interim Change Insert

FROM: AETC TRSS RANDOLPH AFB TX//CC//
TO: AIG 8108//DO//DOV//DOTBB//
INFO: AUL MAXWELL AFB AL//LSAD//
XMT: 71 FTW VANCE AFB OK//DO//DOV//DOTBB//

UNCLAS

SUBJECT: SPECIALIZED MESSAGE CHANGE 97-1 TO T-38 PIT GROUND TRAINING INSTRUCTOR GUIDE, F-V4A-A-GT-IG, JANUARY 1996.

1. WRITE-IN CHANGES

PAGE	PARA	LINE	ACTION
2-3	1E	1	CHANGE "P-V4A-AA-SG, UNITS AA01 AND AA02" TO "P-V4A-B-AA-WB, LESSONS AA0205-AA0210."
	1F	1	RENUMBER PARA AS 1G.
	1F	1	ADD NEW PARA AFTER 1E: "1F. UPT AERODYNAMICS NOW CONSISTS OF 2 BOOKS."

2. OPR IS CAPT JOHN JONES, DSN 487-1234.

JOHN JONES, CAPT, USAF (drafter)
AETC TRSS/IDX, 71234
R.B.KLINE/LTC/CC/76433 (releaser)

Figure 12-4 — Specialized Message Change

Chapter 13

Coordination Cycle

This chapter contains example checklists for the review of new or revised syllabuses (Figure 13-1), examinations (Figure 13-2), EWO examinations (Figure 13-3), courseware (Figure 13-4), EWO courseware (Figure 13-5), and computer courseware (Figure 13-6). These checklists are cover sheets for your publications to ensure proper flow and help you track their progress. The approximate times are for reference to plan the time required for your product to reach the field. Don't copy the checklists in this handout; always use the *Coord Cycle* document in the *Cover Pages* folder on the file server. These templates will always be more current than the examples in this handout.

At step 11 for syllabus coordination, open FormFlow, and prepare an AF Form 673, *Request To Issue Publication*, as shown in Figure 13-7. Also prepare an accompanying explanatory memorandum from HQ AETC/DOF to AETC TRSS/CC, 19 AF/DO, AETC/DOR, AETC/ADO and AETC/DO. Briefly explain the purpose of your syllabus, revision, or change. The coordination cycle cover sheets for examinations and courseware should only be used for review within the TRSS, and follow the AF Form 673 example in Figure 13-8. Use the example in Figure 13-9 to prepare an implementation letter. This template is also found in *Coord Cycle.* When all steps are finished, file the completed checklist in your correspondence folder.

Syllabus Coordination Checklist

OPR Name & Office Symbol	*Syllabus Title*	*Cover Date*
Maj Jones/DOFX	**T-38 SUPT Syllabus**	**January 2000**

Step	*OPR*	*Action*	*Concur*	*Date*	*Initials*
1.	Branch Chief & OPR	Meet to review course and determine plan.	*yes*	*15 Dec 99*	*JJJ*
2.	OPR	Write the syllabus or change in Microsoft Word.	*yes*	*15 Jan 00*	*JJJ*
3.	Branch TPM	Proofread, edit, and discuss with OPR. Prepare Portable Document Format (PDF) file (OPR option) for electronic coordination.	*yes*	*25 Jan 00*	*JPF*
4.	OPR	Prepare Electronic Staff Summary Sheet (ESSS). Attach this checklist and syllabus PDF or Word file.	*yes*	*30 Jan 00*	*JJJ*
5.	AETC/DOFP	Review for CRM, initial checklist, & coordinate on ESSS.	*yes*	*31 Jan 00*	*PBM*
6.	AETC/DOFV	Review, initial this checklist, and coordinate on ESSS.	*yes*	*1 Feb 00*	*SLB*
7.	Branch Chief	Review and release for 3-letter coordination. Initial this checklist and coordinate on ESSS. E-mail to office symbols in steps 8 – 10.	*yes*	*2 Feb 00*	*CBJ*
8.	AETC/DOR	Review, initial this checklist, and coordinate on ESSS.			
9.	AETC TRSS/CC	Review, initial this checklist, and coordinate on ESSS.			
10.	19 AF/DO	Review, initial this checklist, and coordinate on ESSS.			
11.	OPR	Incorporate corrections/suggestions. Print paper copy of syllabus. Combine all ESSS coordination and print. Prepare AF Form 673 and 5×9 memo for AETC/DO, ADO, DOF and ADOF.			
12.	AETC/ADOF	Review. Initial this checklist and 5×9 memo. Coordinate in Section 2 on AF Form 673.			
13.	AETC/DOF	Review, initial this checklist and 5×9 memo. Sign in block 18 on AF Form 673.			
14.	AETC/ADO	Review, initial this checklist and 5×9 memo. Coordinate in Section 2 on AF Form 673.			
15.	AETC/DO	Review and sign in block 21 on AF Form 673 and on syllabus purpose page.			
16.	Branch TPM	Generate PDF file and e-mail to TRSS bookstore to post. File AF Form 673, signed purpose page, checklist, & ESSS. Archive document file.			
17.	OPR	Send implementation notice. Notify 12 OSS bookstore if publication applies to them.			

Comments

Figure 13-1 — Syllabus Coordination Checklist

Examination Coordination Checklist

TPM Name & Office Symbol	*Examination Title*	*Cover Date*
Capt Jones/IDX	**T-38 Systems Examination**	**January 2000**

Step	*OPR*	*Action*	*Days*	*Date*	*Initials*
1.	TPM	Write examinations. Ensure questions test objectives. Spell check.	as required		
2.	Another TPM	Proofread.	3		
3.	Flight ISD	ISD review and QC.	3		
4.	F/BTF, NTF or PTF	Review if applicable.	3		
5.	Flight Commander	Initial review	3		
6.	TPM	Make corrections.	1		
7.	TPM	Have a TPM not previously involved take the exam.	2		
8.	TPM	Make corrections. Write implementation letter.	3		
9.	Flight Commander	Final review. Include the proofread copy with the clean copy.	2		
10.	QAF	Review. Sign implementation letter.	2		
11.	TPM	Prepare exams to mail (Include AF Form 74).	1		
12.	CCQA	Ensure proper address and packaging. Assign container number and send. Give completed checklist to TPM to file in correspondence folder.	1		
			24 work days = 32 calendar days		

Notes

1. Secure examinations and answer keys.
2. Cover examinations when not working.
3. Secure all materials overnight.
4. Do not store examinations or answer keys on hard drive or file server.
5. Store examinations and answer keys only on floppy or Ocean disks.

Figure 13-2 — Examination Coordination Checklist

SECRET (*example only*)

EWO Examination Coordination Checklist

TPM Name & Office Symbol	*Examination Title*	*Cover Date*
Capt Jones/IDN	**EAP Examination**	**January 2000**

Step	*OPR*	*Action*	*Days*	*Date*	*Initials*
1.	TPM	Write examinations. Ensure questions test objectives. Spell check.	as required		
2.	Another TPM	Proofread.	3		
3.	Flight ISD	ISD review and QC	3		
4.	F/BTF, NTF or PTF	Review if applicable.	3		
5.	Flight Commander	Initial review.	3		
6.	TPM	Make corrections.	1		
7.	TPM	Have a TPM not previously involved take the exam.	2		
8.	TPM	Make corrections. Write implementation letter.	3		
9.	Flight Commander	Final review. Include the proofread copy with the clean copy.	2		
10.	QAF	Review. Sign implementation letter.	2		
11.	TPM	Deliver one copy of exam and implementation letter to 563 FTS. File completed checklist in master exam folder in safe.	2		
			24 work days = 32 calendar days		

Notes

1. Secure examinations and answer keys.
2. Secure all classified materials in safe.
3. Do not store examinations or answer keys on hard drives or file server.
4. Store examinations and answer keys only on floppy disks or removable hard drives.

Figure 13-3 — EWO Examination Coordination Checklist

SECRET (*example only*)

Courseware Coordination Checklist

TPM Name & Office Symbol	*Title*	*Cover Date*
Capt Jones/IDX	**T-38 Systems Instructor Guide**	**January 2000**

Step	*OPR*	*Action*	*Days*	*Date*	*Initials*
1.	Flight Commander, QAF, TPM, TTF	Meet to review course and determine plan. Check for syllabus effect.	1		
2.	TPM	Complete the *Examination Checklist*, then write the publication/change. Complete spell check.	as required		
3.	Another TPM	Proofread.	5		
4.	Flight ISD	Review and QC.	5		
5.	CCQA	Check distribution.	1		
6.	TPM	Make corrections, and prepare AF Form 673. Prepare MFR if needed. Write implementation letter.	3		
7.	Flight Commander	Review and coordinate on AF Form 673/MFR. Include the proofread copy with the clean copy.	2		
8.	QAF	ISD review and QC. Review and coordinate on checklist/MFR. Sign AF Form 673. Sign implementation letter.	3		
9.	TPM	Coordinate with TRIM. Generate CD & AF Form 74.	2		
10.	TRSS/CCQA	Check distribution block for accuracy. Update index. Send for printing and distribute CDs & AF Forms 74.	5		
11.	TPM	Mail implementation letters. Include any slide changes. Ensure document file is properly archived. File completed checklist in correspondence folder.	1		
			28 work days = 38 calendar days		

Figure 13-4 — Courseware Coordination Checklist

SECRET (*example only*)

EWO Courseware Coordination Checklist

TPM Name & Office Symbol	*Title*	*Cover Date*
Capt Jones/IDX	**EAP Student Guide**	**January 2000**

Step	*OPR*	*Action*	*Days*	*Date*	*Initials*
1.	Flight Commander, QAF, TPM, TTF	Meet to review course and determine plan. Check for syllabus effect.	1		
2.	TPM	Complete the *Examination Checklist*, then write the publication or change. Complete spell check.	as required		
3.	Another TPM	Proofread.	5		
4.	Flight ISD	Review and QC.	5		
5.	TPM	Make corrections, and complete AF Form 673. Prepare MFR if needed. Write implementation letter.	3		
6.	Flight Commander	Review and coordinate on AF Form 673/MFR.	2		
7.	563 FTS	Review.	5		
8.	TPM	Make final corrections.	2		
9.	Flight Commander	Review. Include the proofread copy with the clean copy.	2		
10.	QAF	ISD review and QC. Review and coordinate on checklist/MFR. Sign AF Form 673. Sign implementation letter.	3		
11.	TPM	Send for printing. Update index.	2		
12.	TPM	Deliver to 563 FTS.	1		
13.	TPM	Mail implementation letter and AF Form 74 to 563 FTS. File completed checklist in correspondence folder.	1		
			32 work days = 44 calendar days		

Figure 13-5 — EWO Courseware Coordination Checklist

Computer Courseware Coordination Checklist

OPR Name & Office Symbol	*Title*	*Date*
Capt Jones/IDX	**T-37 Systems**	**January 2000**

Step	*OPR*	*Action*	*Days*	*Date*	*Initials*
1.	Flight Commander, QAF, TTF, TPM, ICD	Coordinate pre-production.	2		
2.	TPM	Research & gather photos, videos, etc. Ensure IG is current.	15		
3.	ICD & TPM	Write video script. Prepare storyboards (lesson flow/plan). Determine sections to cover on video.	as required		
4.	TTF	Review script.	2		
5.	Flight Commander & Flight ISD	Review script.	2		
6.	QAF	Review script.	2		
7.	ICD & TPM	Review storyboards & gathered information.	2		
8.	ICDs	Coordinate with narrator and Audio-Visual. Schedule and produce video.	as required		
9.	TPM	Review.	2		
10.	ICD	Incorporate changes & finalize lessons. Formulate picture list and schedule photo sessions. Develop computer lessons.	as required		
11.	TPM, Flight Commander, TTF, & QAF	Final review and approve complete program. (View together and initial separately)	2		
12.	TPM	Revise IG to reflect computer presentation. Send computer media to wings. Implement with revised IG. File completed checklist in correspondence folder.	5		
			34 work days = 46 calendar days		

Figure 13-6 — Computer Courseware Coordination Checklist

REQUEST TO ISSUE PUBLICATION
*(Complete this form by using a typewriter or electronically generate it. * A second page is provided in the EF version of this form.)*

DATE: 20000301

SECTION I - FOR USE BY THE OFFICE OF PRIMARY RESPONSIBILITY (OPR)

1. TO: PUBS MGMT (Functional Address Symbol (FAS), Base, State, and 9-digit ZiP Code)	2. FROM: (FAS, Base, State, and 9-digit ZiP Code)	3. NAME OF PROJECT OFFICER (Last, First, Middle Initial)	4. GRADE/ RANK	5. TELEPHONE NO. (DSN)
HQ AETC/DOFX Randolph AFB TX 78150-4325	HQ AETC/DOFX Randolph AFB TX 78150-4325	Jones, John J.	Major	487-1234

6. PUBLICATION TITLE (If classified, give title to be shown in index.)	7. PUBLICATION NO. (If new, show series number.)	8. PUBLICATION IS:
T-38 Pilot Instructor Training Syllabus	F-V5A-B	☐ NEW ☐ REVISED ☐ CHANGE NO. ☐ SUPPLEMENT TO

9. SUPERSEDED PUBLICATION NUMBER AND DATE	10. NO. OF DRAFT PAGES SUBMITTED	11. ADVANCE COPIES REQ'D	12. DISTRIBUTION ("F" submit functional statement.)
F-V5A-B, January 1998	100	N/A	X

13. CLASSIFICATION (Enter highest level of classification or "N/A".)	14. HIGHER HEADQUARTERS PUBLICATION NO. (If none implemented, enter "N/A".)	15. REQUIRED IMPLEMENTATION DATE (Enter date and explain in "REMARKS".)
Unclassified	N/A	20000401

SECTION II - COORDINATION AND CONCURRENCE *(See AFI 37-160,V1, Table 3.1.)*

FUNCTIONAL ADDRESS SYMBOL	NAME (Typed or Printed and Signature)	DATE	TELEPHONE NO. (DSN)
AETC/DOFV	Lt Col Steven L. Babcock		487-5561
AETC/DOFX	Lt Col Joe J. Smith		487-1234
AETC TRSS/CC	Lt Col Richard M. Fraker		487-6433
19 AF/DO	Col Mark B. Rogers		487-6425
AETC/DOR	Col William O. Faucher		487-4908
AETC/ADO	Col Gary J. Bundy		487-4528

SECTION III - FORMS
(Enter an "X" in status. Submit a DD Form 67 (see AFI 37-160V8) for new or revised forms. Continue on separate sheet for more space.)*

FORM NO.	CURRENT	NEW	REVISED	OBSOLETE

16. REMARKS *(Continue remarks on plain bond paper and attach to this form.*)*

Note
All coordination in Section II may be accomplished with an Electronic Staff Summary Sheet.

I certify that the attached manuscript meets Air Force requirements for necessity, good taste, and applicability to the Air Force.

17. TYPED NAME, RANK, TITLE, AND FAS OF CERTIFYING AUTHORITY	18. SIGNATURE (Please use ink.)	19. DATE
TERENCE L. GILBERT, Col, USAF Chief, Flying Training Division		

I approve the attached manuscript for publication and verify that it is in consonance with Air Force doctrine, existing law, and National, Department of Defense, and Air Force policy.

20. TYPED NAME, RANK, TITLE, AND FAS OF APPROVING AUTHORITY	21. SIGNATURE (Please use ink.)	22. DATE
WILLIAM WELSER III, Major General, USAF Director of Operations, AETC		

SECTION IV - FOR USE BY THE PUBLICATIONS MANAGEMENT OFFICE

23. DATE ASSIGNED	24. NAME OF EDITOR	25. TELEPHONE NO.	26. DATE RECEIVED	27. SUSPENSE DATE

28. PROCESSING ACTIONS *(Enter all actions taken up to time publication is sent to printer.)*

29. CONTROL NO.	30. NAME/TELEPHONE NO. (DSN) OF PRINTING SPEC.	31. PROOFS NEEDED	32. PGS/MSCRIPT:	33. PGS/ARTWK:
		☐ YES ☐ NO	34. PGS. CAMERA-READY TEXT:	

35. DATE RELEASED FOR PUBLICATION	36. SIGNATURE OF PERSON RELEASING COPY (Please use ink.)	37. DATE

AF FORM 673, 19930501 (EF-V2) PREVIOUS EDITIONS ARE OBSOLETE.

Figure 13-7 — AF Form 673 for Syllabuses

REQUEST TO ISSUE PUBLICATION

*(Complete this form by using a typewriter or electronically generate it. * A second page is provided in the EF version of this form.)*

DATE: 20000301

SECTION I - FOR USE BY THE OFFICE OF PRIMARY RESPONSIBILITY (OPR)

1. TO: PUBS MGMT (Functional Address Symbol (FAS), Base, State, and 9-digit ZiP Code)	2. FROM: (FAS, Base, State, and 9-digit ZiP Code)	3. NAME OF PROJECT OFFICER (Last, First, Middle Initial)	4. GRADE/ RANK	5. TELEPHONE NO. (DSN)
AETC TRSS/CCQA Randolph AFB TX 78150-4404	AETC TRSS/XTF Randolph AFB TX 78150-4404	Jones, John J.	Capt	487-1234

6. PUBLICATION TITLE (If classified, give title to be shown in index.)	7. PUBLICATION NO. (If new, show series number.)	8. PUBLICATION IS:
T-38 Pilot Instructor Training Instructor Guide	F-V5A-B-IG	NEW / REVISED / CHANGE NO. / SUPPLEMENT TO

9. SUPERSEDED PUBLICATION NUMBER AND DATE	10. NO. OF DRAFT PAGES SUBMITTED	11. ADVANCE COPIES REQ'D	12. DISTRIBUTION ("F" submit functional statement.)
F-V5A-B-IG, 1 Jul 97	100	N/A	X

13. CLASSIFICATION (Enter highest level of classification or "N/A".)	14. HIGHER HEADQUARTERS PUBLICATION NO. (If none implemented, enter "N/A".)	15. REQUIRED IMPLEMENTATION DATE (Enter date and explain in "REMARKS".)
Unclassified	N/A	20000401

SECTION II - COORDINATION AND CONCURRENCE *(See AFI 37-160,V1, Table 3.1.)*

SECTION III - FORMS *(Enter an "X" in status. Submit a DD Form 67 (see AFI 37-160V8) for new or revised forms. Continue on separate sheet for more space*.)*

FUNCTIONAL ADDRESS SYMBOL	NAME (Typed or Printed and Signature)	DATE	TELEPHONE NO. (DSN)	FORM NO.	CURRENT	NEW	REVISED	OBSOLETE
TRSS/XTF	Maj Joe J. Smith		487-1234					

16. REMARKS *(Continue remarks on plain bond paper and attach to this form.*)*

I certify that the attached manuscript meets Air Force requirements for necessity, good taste, and applicability to the Air Force.

17. TYPED NAME, RANK, TITLE, AND FAS OF CERTIFYING AUTHORITY	18. SIGNATURE (Please use ink.)	19. DATE

I approve the attached manuscript for publication and verify that it is in consonance with Air Force doctrine, existing law, and National, Department of Defense, and Air Force policy.

20. TYPED NAME, RANK, TITLE, AND FAS OF APPROVING AUTHORITY	21. SIGNATURE (Please use ink.)	22. DATE
JOHN A. KENAGY, Lt Col, USAF Chief, Quality Assurance Flight, AETC TRSS		

SECTION IV - FOR USE BY THE PUBLICATIONS MANAGEMENT OFFICE

23. DATE ASSIGNED	24. NAME OF EDITOR	25. TELEPHONE NO.	26. DATE RECEIVED	27. SUSPENSE DATE

28. PROCESSING ACTIONS *(Enter all actions taken up to time publication is sent to printer.)*

29. CONTROL NO.	30. NAME/TELEPHONE NO. (DSN) OF PRINTING SPEC.	31. PROOFS NEEDED (YES / NO)	32. PGS/MSCRIPT:	33. PGS/ARTWK:
			34. PGS. CAMERA-READY TEXT:	

35. DATE RELEASED FOR PUBLICATION	36. SIGNATURE OF PERSON RELEASING COPY (Please use ink.)	37. DATE

AF FORM 673, 19930501 (EF-V2) PREVIOUS EDITIONS ARE OBSOLETE.

Figure 13-8 — AF Form 673 for Courseware

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

1 February 2000

MEMORANDUM FOR 12 OSS/CC
14 OSS/CC
47 OSS/CC
71 OSS/CC
80 OSS/CC

FROM: AETC TRSS/QAF
1150 5TH ST E STE 2
RANDOLPH AFB TX 78150-4404

SUBJECT: Change 1, T-38 Systems Instructor Guide (P-V4A-A-SO-IG, Jan 97)

1. Change 1 to the T-38 Systems Instructor Guide (P-V4A-A-SO-IG, Jan 97) was sent to your bookstore. Implement this change with Class 98-06.

2. Ensure each T-38 Systems academic instructor receives a copy of this change.

3. Ensure your bookstore personnel return the attached AF Form 74 to acknowledge receipt of this change.

4. If you have any questions, please contact Capt Jones at DSN 487-1234.

JOHN A. KENAGY, Lt Col, USAF
Chief, Quality Assurance Flight
AETC Training Support Squadron

Attachment:
Change 1

cc:
12 OSS/OSTS
14 OSS/OSTB
47 OSS/OSTD
71 OSS/OST
80 OG/OSTB

Figure 13-9 — Sample Implementation Letter

Chapter 14

Validation

Introduction

Validation is part of the evaluation phase of ISD. It determines if the material teaches the objectives. Validation during the initial course design is *developmental testing.* Developmental testing ends when course evaluation begins.

Information

Developmental Testing

The complete instructional system is not developed and tested all at once. Portions are tested as they are produced. You are interested in three concepts. First, does the course work; is it valid? Second, if the course doesn't work, what revisions are necessary? Third, if revisions are made, are they valid? If a course is brand new or revised you should apply the three phases of developmental testing: individual tryout, group tryout, and operational tryout.

1. **Individual Tryout —** Conduct the individual tryout to determine if the new material provides what was designed. The purpose is to detect any weak or forgotten area of instruction you may have overlooked during development.

It's important to follow certain procedures. Observe student performance closely. Carefully note what the student does, whether correct or incorrect. If students have trouble understanding or applying principles, they will probably have difficulty with performance. This concept is especially important since the effectiveness of an instructional segment is evaluated only on the student's ability to accomplish the performance.

When certain errors occur repeatedly during successive tryouts, it indicates a revision is necessary. If students fail to meet an objective performance standard, analyze the instruction. Perhaps the instructor noted some difficulty on the part of several students to learn or accomplish a specific step or objective. These facts plus any supporting comments received during student interviews will identify problem areas and provide data for corrective measures. If the unit must be revised significantly, conduct one or more individual tryouts to check the results before proceeding to small group tryouts. However, if the instructional sequence requires only minor changes, a small-group tryout can be started.

2. **Group Tryout —** Conduct the group tryout until you have presented a unit to a total of 20 to 30 students. If possible, the students' aptitudes should be evenly distributed between low, average, and high.

Prepare as you did for individual tryouts. Collect the same data. When group tryouts are complete, and the data collected and documented, conduct the following two types of analyses.

First, calculate the average completion time for each objective to establish a reasonable unit duration.

Second, identify any error pattern in a lesson , then reinforce or improve that unit or the supporting materials.

If you revise a unit significantly, repeat your group tryouts. This cycle of instructing, testing, analyzing and modifying continues until the unit achieves the level specified by the objective(s).

3. **Operational Tryout —** Try out the program in the actual environment. Attempt to obtain the same data as in the first and second phases. Generally, use a minimum of 60 students for the operational tryout.

Initial Revision

Developmental testing will usually indicate certain revisions. These usually include the following:

Student Instructions — must be clear and let the student know exactly what to do. Developmental testing will indicate if instructions must be rewritten.

Transitions — Student comments may indicate instruction wasn't smooth from one step to the next. You may need to add some transition material.

Sequence — Developmental testing might also reveal the need to change the sequence.

Step Size — Tryouts might indicate some steps are too large. You may need to include additional steps. If some steps are too easy, you may decide to combine them.

Revalidation — Following courseware revision, you may revalidate to determine if your changes solved the problems you discovered.

Evaluation

Once the course is in the field, the OPR continually evaluates the course effectiveness. The following sources are available:

Course comment sheets submitted by the students

End-of-course critiques from instructors and students

Stan/eval comments

Staff visit reports

Computer Test Run — AETC TRSS/DO maintains the computer test analyses. A question with a high miss rate should be checked. The question and/or the instruction could be inadequate.

Validating Minor Revisions

Several different feedback mechanisms may cause minor revisions to existing courseware. If the revision is of a "cosmetic" nature, such as grammar or spelling, you need not establish a validation procedure. However, if the revision changes an objective statement, courseware content, or end-of-course exam, then you should develop a validation procedure.

Validate a minor revision by developing a procedure to specifically track the revision. For example, suppose you revise two objectives, the support material, and the related test questions. Track the success of the revision with instructor and student critiques, test analysis data, and grad eval reports for two student classes. When all material is collected and analyzed, you can demonstrate validation for that revision.

Chapter 15

Test Analysis

Introduction

Let's assume your courseware's already in the field and you've written your best product. Your exams are *comprehensive* (covering all objectives) and *balanced* (all versions are comparable in coverage and difficulty). The questions test specific course objectives, and are clear and straightforward.

Now the feedback arrives. Unfortunately, one of the most useful types of feedback is also the most confusing — the test analysis. This chapter removes the mystery so you can improve your courseware. We'll check the information available on the test analysis and how you can use it. We'll also learn how to avoid some traps and misconceptions.

Before we can analyze the results, let's address two fundamental questions.

1. Why do we test?

2. What constitutes a "good" test?

Question 2 is logical. It helps us understand which test result factors are worth knowing and analyzing. But question 1 is equally important because it dictates exam construction, and determines how we interpret and react to analysis data.

The Purpose of Testing

There are many reasons why we test a group of trained individuals.

1. We may want to rank, separate, or compare relative ability or performance (discriminate differences) among the individuals in the population tested. The Olympic 100-meter sprint, SAT, ACT, and GRE all answer the basic question "Where do I stand compared to everyone else?"

2. We may also want to determine each individual's status relative to a well-defined performance standard. We are not concerned whether A is better than B, but if the individuals can do what's asked — a yes/no, pass/fail situation. The Instrument Refresher Course (IRC) exam, boldface tests, drivers' tests, and checkrides fall into this category. In each case, the fundamental question is "Can I or can't I?"

3. It's also possible to use a test as a learning tool, and let the grades measure progress or effort. Term papers and take-home problems fall into this category.

Most tests accomplish all three — compare members of the group, determine whether or not individuals can "hack it," and instruct something along the way. But all tests should have a single primary purpose, and the OPR must have a clear picture of that purpose.

A *norm-referenced test* discriminates, separates, and/or compares as in paragraph 1. The results of the test determine what's "normal" or average, who's above or below average, and by how much. Since we're concerned with where people stand compared to others, and not compared to a preestablished standard, it's appropriate to grade such a test "on a curve."

A *criterion-referenced test* compares individuals to a standard as in paragraph 2. Grading on the curve is inappropriate. For example, if most students in a UPT class are unable to complete a boldface test properly, we would not give an "A" to those with the fewest errors. There's a standard to meet, and it doesn't matter if you are above average if you don't meet that standard.

A *graded exercise* is primarily a learning tool as in paragraph 3. We won't discuss this type of exam.

Our end-of-course exams are criterion-referenced tests. ISD requires us to identify what we want our students to accomplish, instruct them to do it, and then use the exam to see if we succeeded. Our exams do discriminate somewhat, but that's not a goal. Students probably learn a few things when taking a test, but according to ISD, it's improper to write a question with the purpose of exposing a student to new concepts.

Unfortunately, criterion-referenced tests are difficult to write and analyze. Determining needs and objectives is difficult, and testing those objectives is harder. Perhaps the most difficult is determining the standards — if you score 85 percent, have you met the training objectives? Very few OPRs take time to write and refine good criterion-referenced tests. It's far easier to assume the test is norm-referenced, ask what seems to be important, and grade on a curve.

In this chapter we're concerned with analyzing existing exams. The type of test, norm-referenced or criterion-referenced, affects the construction and analysis. We must clearly identify the purpose of our test.

Reliability

What constitutes a "good" test?

Suppose every time you weigh yourself on a scale you get a different reading. It's possible that you gain or lose weight very quickly, but it's not likely. You probably wouldn't have much confidence in the measuring

instrument, because you expect a bit more consistency from one reading to the next. You're looking for *reliability,* expecting the same assessment every time you measure the same condition. You want a consistent measuring instrument.

Here's another example. We want to measure dart-throwing ability. But if the test involves giving everybody one dart to throw, it's probably not going to be very reliable. Anyone can get lucky once, and even an expert might miss now and then, so someone could do well on the test today and poorly tomorrow. A one-dart test would provide no consistent assessment of ability. A ten-dart test would be more reliable. Increased repetitions generally improve reliability.

The reliability of a written achievement test involves the same general idea — we want the same assessment of ability every time we test the same individual, assuming the ability doesn't change. Measuring the reliability of a scale is one thing (step on it many times and see if the readings vary), but checking the reliability of a written test is entirely different. We can't give someone the same test repeatedly; they'll begin to remember the test.

We can determine reliability, but it's fairly complicated. Instead, we'll look for clues to identify potential reliability problems. For example, suppose the mean on version 1 of your exam is 81.3, but version 4 has a mean of 96.2. It's possible that the class taking version 4 was significantly better than the one with version 1 (or maybe one instructor was better than the other), but that's not very likely, especially if the same result occurs several times. It's far more likely that version 1 is harder, or measures different skills. There's a good chance your versions are unreliable.

If the bathroom scale reads 195 every time you step on it, your measuring instrument is very reliable. But what if you don't weigh 195? We want reliability (consistent results), but we also want the questions to accurately measure *what* we're trying to measure. This concept is *validity* and is best illustrated with some examples:

> Objective — Identify a horse when you see one.
>
> Question — Draw a picture of a horse.

Even if we found a way to grade this question reliably, it's still unacceptable. The question doesn't test the objective; it tests a completely different (and far more difficult) skill. It doesn't measure *what* we're trying to measure, so it's completely invalid.

If the example seems unrealistic, here's one from an actual T-38 aero exam from several years ago which illustrates the same mistake:

> Objective — Know the recovery from excessive sink.
>
> Question — Here's a pattern situation — should you or should you not go "burner" …?

Both students and instructors complained that the question was too difficult. The OPR didn't intend it to be easy, and believed the question was acceptable because the results were *consistent*. But the OPR failed to recognize the distinction between reliability and validity. The question was *reliable* (consistent results) but *invalid*. Both the question and objective shared the same topic (sink recovery), but that's where the similarity ended. The objective required students to know the recovery procedure from an excessive sink, but the question asked them to distinguish between an *excessive* sink and one that's not. It did not measure performance on the intended task, and was removed.

Consider the last two questions on the old IRC test. Although they were reliable and seemed valid, they were consistently among the most frequently missed questions. The problems required the "whiz wheel," and after 98 questions, the "care index" was running low. If pilots knew they had already passed the test, some "educated guessing" probably occurred. Those questions were reliably measuring something other than ability with the flight computer. Even though the questions looked fine, they were probably reliable but invalid.

There's more to validity than verifying that objectives and questions match. A long test may measure patience, a timed test could measure speed, and a tricky question may measure grammar knowledge or logic. If any of these problems exist, the questions may look fine and still be invalid. Constructing a good test requires much more than knowing the definitions of reliability and validity.

The second source of error in test construction and analysis is failing to recognize the *distinction* between reliability and validity. No matter how reliable (consistent) the results, the first measure of a test or question is validity — does it actually measure what it's supposed to? Validity means more than checking to see if the topic covered by the question is the same as the objective. This distinction is important.

If a question is incompatible with the objective, the validity problem is solved by changing the question or refining the objective. **Therefore, you *must* construct objectives and write exam questions in a single ISD phase.**

Test Analysis Products

Although students use an AETC Form 1603 to record their answers on most multiple-choice flying training exams, they are also hand-graded. The instructor enters an overall score on the form after grading. When all the forms are scored and coded, an answer key is added and the stack is scanned. The information is stored in the TRIM computer by base exam and version number. The base files are forwarded to the TRIM development site at Randolph,

stored on tape, and are available as input for the numerical summary program. Any errors during preparation don't affect the student grades. Because the answer sheets are graded by hand, an error, such as mismarking the master sheet or miscoding a student's grade, will only distort the *summaries*.

The computer generates the following three products; they are kept on file and available to the OPR:

1. Item analysis — Wing Summary. This printout summarizes the results at a single UPT Wing: How did Vance class 95-01 do on AA exam version #2? This product is structured the same as the command summary, and contains the same type of information. It's kept on file, but is not usually passed around.

2. Test Analysis — Summary of Exam Results. The test analysis summarizes the exam: mean, standard deviation, pass/fail rate, USAF and international student performance, etc. It summarizes the results for an entire class, both command-wide and by wing. These printouts indicate if one exam version is consistently more difficult than another. The forms are kept on file.

Only the command item analysis products routinely arrive on your desk, and we'll explain these in detail. If you understand the command item analysis, you'll know when to ask for the others.

3. Academic Item Analysis — Command Summary (Figure 15-1). This printout combines all wings together to show how a single class did as a group on one version of the exam for a specific course. If one section of 97-01 at Columbus, Laughlin and Vance took version #1 of the Applied Aerodynamics (AA) exam, the computer combines all three groups together and produces a single output summarizing the results on each question. You'll receive this product quarterly, so we'll discuss it in detail. The sample sheet summarizes the performance of 45 students (called the population sample size and symbolized by n; so $n = 45$). The exam was given to three sections: 16 students at Columbus, 14 students at Laughlin, and 15 students at Vance. We could verify the student distribution by checking the file for the wing item analysis printouts.

Class 97-01 could generate up to four pages for this particular course (one for each exam version), but there may be fewer if some versions were not used. There may also be a wide variance in the number of students per sheet; perhaps only one small section at Laughlin took version 1 ($n = 14$), but three large sections took version 4 ($n = 94$).

The information at the top is the class, course and exam version. The question numbers and correct answers appear along the left side of the page. The computer has the correct answers from an answer key sheet. If there is a mistake, the results will be badly skewed, but the students' *scores* will not be affected. If we move from left to right, the next item is the number and percentage of students who missed each question.

The computer stores all the results and it ranks and divides the students by overall scores into three groups — *high*, *middle,* and *low*. If n is equally divisible by three, each group will be the same size. If not, the groups are arranged so the high and low groups are the same size, and the middle group has one more (or less) student. On our sample sheet, the high, middle and low groups each have 15.

There may also be some "slop" in the division. For example, if 30 students missed one question, some will be in the high group and some in the middle, depending on the order the answer sheets were entered. The statistics may change if the sheets are "shuffled" and reentered, but if n is large, the effect is slight.

The right-hand side of the sheet lists the number of students in each group, and the total number who marked the correct answer. For example, on question #20, all 15 in the high group, 15 in the middle group, and 13 of 15 in the low group were correct, for a total of 43 out of 45. As you'd expect, most of the incorrect answers were from the low group. The large center section of the form depicts how many in each group selected each possible distractor. On question #20, everyone in the high group selected "d" (the correct answer), and the same results in the middle group. In the low group, "c" was selected twice. Some patterns and questions arise.

1. Why is distractor "c" the most commonly selected incorrect answer? Is it too tricky (an *exam* problem)? Or is there some way we can improve *instruction* so the concept is clearer? Note what we said — *Test analysis seeks improved instruction, not just improved tests.*

2. Why didn't someone select distractor "a"? We don't want students to choose a distractor. But if it's obviously wrong, is it a waste of ink? If this analysis only covered 10 – 15 students, we wouldn't think twice. But if the sample were 500, we'd give it some attention. This situation illustrates another point: the smaller the sample, the less conclusive the results. If $n < 20$, the statistics are unreliable.

The three groups and the raw data are most important. But there are some other facts on the form to summarize and highlight certain aspects of the raw data. Let's look at two of them.

Ease Index

The ease index, p, is the percentage of the population with the correct answer. An ease index of $p = 0.7$ means 70 percent of the population answered the question correctly. The ease index is easy to define, but there are some traps.

1. A high ease index doesn't necessarily mean the question is easy. It may mean that a difficult skill has been mastered. For example, landing an aircraft isn't easy, but a landing test at the end of UPT should have an ease index at or near p = 1.

2. When $n < 20$, the ease index isn't completely worthless, but be skeptical. Check another sheet with the same version and don't simply average the ease indexes. If p = 0.7 with $n = 100$ on one sheet, and p = 0.8 with $n = 10$ on another, the combined ease index is not 0.75. The wing item analyses usually aren't reliable because each sample is too small.

3. Don't assume one analysis, even with large *n*, tells the entire story. A sheet with $n = 85$ and p = 0.25 indicates only 25 percent of the population got it right. But another sheet with $n = 90$ had p = 0.82 for the same question. You may suspect a poor instructor or a bad class, so check the wing summary. In this example there was an error on the answer key. The computer thought most students had missed the question, when in fact they had it right. It's important to avoid jumping to conclusions based on only part of the evidence.

4. Don't assume that bad numbers mean a *bad* question. A vague or misleading objective, or poorly written student guide could cause a low ease index. Instead of changing the exam question, the correct fix may be a change to the books.

Don't assume that good numbers mean a *good* question. If the T-38 aero exam asks "Who is the Secretary of Defense?" it doesn't matter what the ease index is — the question is invalid. Is the question consistent with the objective? Is that objective appropriate? Can you show in the IG and SG why it's the correct answer? Can you show why the distractors are wrong? Does some aspect of the material need more emphasis? If the answer to any of these questions is "no," the question is at least unfair. Use the results to evaluate *all* aspects of the course. You may not need to change the question; you may need to change the IG or SG.

What values of the ease index are acceptable? Only you can decide, but there are some guidelines. By definition, a criterion-referenced test means you expect mastery, so a high ease index is normal. Since 85 percent is the minimum passing score on our exams, the ease index on a typical question should be above that. Use the following ranges a guide:

.90 – .97	typical
.80 – .90	acceptable for a small percentage of questions
.65 – .80	deserves attention; a change to courseware may be necessary
< .65	you have a problem (not necessarily with the exam)

What about an ease index of 100? In principle, that's okay, and on any sheet you may have a few. But if p = 1 for very large *n*, you probably have a defective question. There's either something in the structure of the question to give away the answer, or the material is so simple it's not worth asking. In either case, you're wasting ink, and probably should revise the question. When you see p = 1 on a sheet, you should probably check a few other printouts.

Check for questions with an ease index less than 0.8 and take a closer look. After a new exam or recent change, you should study the results carefully, question-by-question.

Discrimination Index

The ease index doesn't tell the complete story. Consider three separate questions, all given to 100 students, all with an ease index of p = 0.7. Suppose the breakdown of correct responses among the high, middle, and low groups looks like this:

ITEM	CORRECT RESPONSE			
	HIGH	MIDDLE	LOW	EASE INDEX
1	17	23	30	70.00
2	23	24	23	70.00
3	31	23	16	70.00

All three items have the same ease index, but the results are very different. On the first question, the weaker students scored better than the strong group. On the second question, there is no correlation between overall performance on the exam and performance on this specific question. And on the third question, the strong students did well, and the weaker ones didn't.

Without more information, you'd probably suspect that question 3 is the best question of the three. After all, you'd expect the strong students to do the best on a truly fair question. But other issues, like validity, are important. There's no guarantee the students the exam identifies as strong are really the strong ones. Even if the high group really is composed of the strong students, nothing says they have to be strong on this particular question. But on a given question, we expect the good students to do better than the weaker ones. The question *discriminates* between the weak and strong performers, and discrimination is not a goal of criterion-referenced tests — we want the weak group to achieve mastery also. However, we don't expect the kind of results showing up on questions 1 and 2 above. These two questions look suspicious; perhaps there's a problem with the exam or the courseware. Fortunately there's a number that measures the correlation between overall performance on the exam and performance on a specific question. Let's look at the difference between the number of correct responses in the high group and low group. For example, consider 60 students, 20 in each of the three groups:

CASE 1 — All 20 in the high group got the question right, and nobody in the low group got it right.

(# right in high) minus (# right in low)

20 - 0 = 20

CASE 2 — Nobody in the high group got it right, but all 20 in low group got it right.

(# right in high) minus (# right in low)

0 - 20 = -20

CASE 3 — The high group and low group did equally well on the question.

(# right in high) minus (# right in low)

20 - 20 = 0

So high - low > 0 means "good" or "expected" discrimination,

high - low = 0 means no discrimination, and

high - low < 0 means "bad" discrimination.

But is +20 too high? Is -5 too low? It depends on the group size. If we divide by ($n \div 3$) we get a more useful number:

CASE 1 divided by 20 = +1

CASE 2 divided by 20 = -1

CASE 3 divided by 20 = 0

This process defines the *discrimination index,* $D = (H - L) \div (n \div 3)$ where

H = # right in high group (top third)

L = # right in low group (bottom third)

n = population size.

D will always be between -1 and +1. If D = l, everyone in the high group got the question right, and everyone in the low group got it wrong ("perfect" discrimination). You'll probably never see D anywhere near l for two reasons.

1. It's impossible to have D = l unless p < .67 (which will probably never happen on one of our exams); and

2. Even if it were possible, it would mean we have zero percent mastery from the low group (inconsistent with our purpose). If D = O, the question doesn't discriminate at all. If D = -1, the lows all got it right and the highs all got it wrong (clearly a ridiculous situation); in fact, any negative D warns of a potential problem.

Note — The discrimination index is also called the *differentiation* index. In fact, "DIFF' stands for differentiation on the item analysis sheet. Many people mistakenly think DIFF means "difficulty index"; it doesn't.

We don't want a negative D. But D will tell us more if we look further.

D doesn't tell you everything. It ignores the middle group. For example, here are two questions with the same *n*, p, and D. Notice the difference in the middle group:

p	D	HI	MID	LO	
.67	.35	17	13	10	(n = 60)
.67	.35	14	19	7	(n = 60)

For a given ease index, there's a limit to the discrimination possible. Very easy questions are poor discriminators. Consider a question with p = .95 given to 60 students (a total of 3 people missed the question). Even if all three misses came from the low group, the best discrimination possible, you'd have $D = (20 - 17) \div 20 = .15$, a fairly low discrimination. This result isn't surprising, since discrimination isn't the goal. But here's a fact that *is* noteworthy: don't use a few hard questions as separators because they are poor discriminators. When a question has many misses (low p), the high group takes their share of the hits, so it's hard to get a big "high-versus-low" difference. The best discriminators are questions of moderate difficulty. *Don't use separator questions.* They violate the purpose of our tests and they don't separate.

Use D only when n > 20 (preferably much greater than twenty). The discrimination index is unreliable for low *n*, and worthless for *n* - 20. Don't combine several pages together to get an overall discrimination index; it's not worth the effort. A student in the high group on one sheet may belong in the middle group on another.

With an acceptable population size, what values of D should you expect? What values should signal potential problems?

Easy questions (high p) will always have a low D; there's nothing you can do. Hard questions (low p) don't belong on our tests. We're concerned with questions of moderate difficulty (p between .65 and .85). Negative D is always a problem, and a high positive D is unlikely if not impossible. *Avoid a low positive D on a question of moderate difficulty.* For example, if you have a question with p = .7 and D = 0.025, 30 percent of the students missed the question. There's essentially no correlation between overall ability and performance (D is near zero). So, *for questions of moderate difficulty* (.65 - p - .85), *look for* D > percent wrong. For example, if p = .7, look for D > .3.

Summary

Test analyses may seem intimidating. Here are some suggestions:

Begin by scanning through the products.

1. Which versions of the exam are included?
2. How many pages for each version?
3. How large a sample on each page/version?

Decide which questions to look at more closely.

1. If this is the first or second time a new exam has been given, consider checking each question.

2. Place the exams on one side of your desk, and the item analysis on the other. Read each question, then look at the data for that question.

3. If the exam has been in the field for a while, you can limit your attention to questions with suspicious-looking statistics. Look at questions with

   a. $p < .8$, especially if D is low.

   b. $D < 0$.

   c. recently revised questions.

   d. $p = 1$, especially if *n* is high.

Note — Statistics can reveal *if* there's a problem, but they can't *identify* the problem. Also, no statistics can guarantee a question is a good one.

As you look at each question, compare pages and combine data to get a clearer picture. If necessary, check the wing item analysis.

Don't just look at the question. Also look at the following items:

1. Objective — Does the question really test the objective? Is the objective clear and appropriate?

2. IG/SG — Can you find the right answer in the books? Can you show why the distractors are wrong?

3. Distractors — Which were selected, and why? Which were not selected, and why not?

4. Comparable questions on other exams — How does the data compare? Can I account for the difference? Can I fix a potential problem before it shows up?

Don't be defensive. There are techniques to increase the chances of writing a quality exam, but it's impossible to anticipate all the potential problems.

The goal is improved *instruction*, not just improved exams. If your analysis ends with "the *question* is fine," you're not finished. You may need to improve your courseware.

PREPARED: 97 JUL 01 ACADEMIC ITEM ANALYSIS PCN: UE038DP61

CLASS 95-01 TEST: AA0090 TEST FORM NUMBER: 01 TOTAL ITEMS: 37

ITEM	ANS	MISSES TOT	MISSES PCT	HIGH RESPONSES -A-	-B-	-C-	-D-	-E-	OMT	MID RESPONSES -A-	-B-	-C-	-D-	-E-	OMT	LOW RESPONSES -A-	-B-	-C-	-D-	-E-	OMT	CORRECT RESPONSES HIGH	MID	LOW	TOT	EASE INDEX	DIFF INDEX
1	B	5	11.11	1	14						15					4	11					14	15	11	40	88.89	.200
2	D						15						15						15			15	15	15	45	100.00	
3	A	2	4.44	15						15						13	1		1			15	15	13	43	95.56	.133
4	D	3	6.67				15						15			1	1	1	12			15	15	12	42	93.33	.200
5	B	2	4.44		15						14		1			1	14					15	14	14	43	95.56	.066
6	C	2	4.44			15						15				2		13				15	15	13	43	95.56	.133
7	C	1	2.22			15						15				1		14				15	15	14	44	97.78	.066
8	D						15						15						15			15	15	15	45	100.00	
9	A	2	4.44	15						15						13	2					15	15	13	43	95.56	.133
10	A	1	2.22	15						14	1					15						15	14	15	44	97.78	
11	B	2	4.44		15						14		1				14		1			15	14	14	43	95.56	.066
12	D	3	6.67				15			1			14			2			13			15	14	13	42	93.33	.133
13	D						15						15						15			15	15	15	45	100.00	
14	D						15						15						15			15	15	15	45	100.00	
15	C	5	11.11			15					1	14					2	11	2			15	14	11	40	88.89	.266
16	A			15						15						15						15	15	15	45	100.00	
17	C	2	4.44			15				1		13	1					15				15	13	15	43	95.56	
18	B	1	2.22		15						15						14	1				15	15	14	44	97.78	.066
19	C	1	2.22			15						15					1	14				15	15	14	44	97.78	.066
20	D	2	4.44				15						15					2	13			15	15	13	43	95.56	.133
21	D	7	15.56			1	14			1		3	11					2	13			14	11	13	38	84.44	.066
22	B				15						15						15					15	15	15	45	100.00	
23	B				15						15						15					15	15	15	45	100.00	
24	B				15						15						15					15	15	15	45	100.00	
25	D	5	11.11			1	14			2			13			2			13			14	13	13	40	88.89	.066
26	D	1	2.22				15						15			1			14			15	15	14	44	97.78	.066
27	C	3	6.67			15				1		14				2		13				15	14	13	42	93.33	.133
28	B	2	4.44		15						14	1					14		1			15	14	14	43	95.56	.066
29	C	3	6.67			15					1	14					2	13				15	14	13	42	93.33	.133
30	C					15						15						15				15	15	15	45	100.00	
31	D	4	8.89				15						15			3		1	11			15	15	11	41	91.11	.266
32	D	3	6.67			1	14					2	13						15			14	13	15	42	93.33	.066
33	C	3	6.67		1	14						15				2		13				14	15	13	42	93.33	.066
34	C					15						15						15				15	15	15	45	100.00	
35	D						15						15						15			15	15	15	45	100.00	
36	D						15						15						15			15	15	15	45	100.00	
37	D	3	6.67				15					1	14					1	13		1	15	14	13	42	93.33	.133

Figure 15-1 — Academic Item Analysis

Attachment 1

Handy Tips

Use the following list of words and phrases when writing and editing flying training publications. References are The Tongue and Quill, © 30 June 1997; Webster's Ninth New Collegiate Dictionary, © 1990; and the United States Government Printing Office Style Manual, © March 1984.

General

1. Any airspeed terminology — use KIAS, KEAS, KTAS and knots GS.

2. When making lists, put periods after the listed word(s) only if they form a complete sentence or complete a sentence started in the stem.

3. Abbreviations should be consistent.

4. Plurals of acronyms — NAVAIDs, NOTAMs (no apostrophe)

5. The letter following a hyphen is lower case unless used in a title.

A

α (*not* a or $\propto$)
a while (not awhile)
accessory
accommodate
acknowledgment
adviser (advisor is a legal term)
affect (verb, to influence)
    effect (noun or verb, result)
aim point
air-conditioning
airspeed
all right (*not* alright)
and(or) (*not* and/or; try to avoid, use "and" or "or")
antenna (singular) and antennas (plural, *not* antennae)
appendix (singular) and appendixes (plural, *not* appendices); try attachment(s) instead
assure (to give confidence)
    ensure (to make certain), insure (to protect)
asymmetric (*not* unsymmetric or unsymmetrical)
angle of attack
angle-off

B

back up (verb), backup (adjective or noun)
backward (*not* backwards)
break out (verb), breakout (adjective or noun)

C

caveat (noun; a caution. *Don't* use as a verb)
CG (center of gravity)
centerline
chart (instead of map)
checkpoint
checkride
climb out (verb), climbout (adjective or noun)
collocated
COMM/NAV
crewmember
criterion (singular) and criteria (plural)
cross section
cross-check (verb, adjective or noun)
cross-country
cross-cockpit
cross-tune
crosswind
curriculum (singular) and curriculums (plural)
cut off (verb), cutoff (adjective or noun)

D

Dash One
dead reckoning
degrees — 90º or 68 ºF = 20 ºC (*note the space*)
disk (*not* disc)
DoD (*not* DOD)
dogleg
downwind

E

EGT
emergency (*not* emergency situation)
enroute
exceed

F

farther (distance), further (degree)
field of view
fingertip
fix-to-fix
flame out (verb), flameout (adjective or noun)
flammable (*not* inflammable)
flightcrew
flightline
flightpath
fly-off
formula (singular) and formulas (plural, *not* formulae)
four-ship
fpm (feet per minute)
full-stop

G

Gs (*not* G's, gs or g's)
    (g is acceleration and G is force)
G-LOC
game plan
gamut (entire range), gambit (an opening move)
gauge (*not* gage)
glareshield
glidepath
glideslope
go around (verb), go-around (adjective or noun)
gradebook
gradesheet
groundspeed
groundtrack

H

high-level
hijack
headwind

I

Immelmann
impact (avoid; use "effect" instead)
index (singular) and indexes (plural, *not* indices)
inflight
its (possessive pronoun), it's (contraction of "it is")

J

jetwash
join up (verb), joinup (noun)
judgment (*not* judgement)

K

knots (*not* kts)

L

labeled (*not* labelled)
lead point
level off (verb), level-off (adjective or noun)
leveled (*not* levelled)
lift off (verb), liftoff (adjective or noun)
line-abreast
line of sight
line up (verb), lineup (adjective or noun)
low-level

M

Mach
man-made
medium (singular) and media (plural)
memorandum (singular) and memorandums (plural, *not* memoranda)
midphase
minimum (singular) and minimums (plural, *not* minima)
MIL, MAX
mph

N

NAVAID
night-fly
NM (nautical miles) *not* nm
no-flap
non (single word, no hyphen; except when it precedes a proper noun)
NOTAMs (*not* NOTAMS or NOTAM's)
no-wind
nose low (adverb), nose-low (adjective)
nosewheel

O

on course (oncourse is an adjective)
ordinance (law), ordnance (weapons)
over-the-top (adjective), over the top (adverb)

P

percent (a measurement), % (a throttle or flap setting, or gauge indication)
pph (fuel flow in pounds per hour)
preflight
proceed
pull off, pull out, pull up (verb)
pulloff, pullout, pullup (adjective or noun)
purview (noun; range of responsibility)
purvey (verb; to supply or procure)

R

regardless (*not* irregardless)
rhythm
roll out, roll in, round out (verb)
rollout, roll-in, roundout (adjective or noun)
RPM
run up (verb), runup (noun)

S

satellite
self-explanatory
set up (verb), setup (adjective or noun)
ship-length, ship-width
shut down, shut off (verb)
shutdown, shutoff (adjective or noun)
single-engine
60-to-1 rule
solid-state
speed brake (T-37 & T-38)
split S
straight-and-level (adjective); straight and level (adverb)
straight-in
Sun, Moon & planets (Mercury, Mars, Venus)
supersede
exceed, proceed, succeed
(all others are -cede, e.g. precede, secede)
swept wing
syllabus and syllabuses (*not* syllabi)

T

T-37 Checklist
T-37 Dash One
T-37 (aircraft)
T50 (simulator, *no* hyphen)
tailwind
take off (verb), takeoff (adjective or noun)
tally-ho
three-ship
threshold
thumbs-up (noun)
touch-and-go
touch down (verb), touchdown (adjective or noun)
toward (*not* towards)
two-ship

U

upwind

V

vortex (singular) and vortexes (plural, *not* vortices)

W

whifferdill
windscreen or windshield (be consistent)
wings-level
wingtip
wingwork
work load
worksheet

Z

zero — ø
Zulu

Attachment 2

Simpler Words and Phrases

Official writing doesn't require big words or fancy phrases. I borrowed this list from AFH 37-137, *The Tongue and Quill,* and deleted a few items.

Instead of	*Try*
A	
a great deal of	many, much
a minimum of	at least
a number of	few, many, some
a period of (2 days)	for
abandon	give up
abet	aid, assist, help
abeyance (hold in)	delay, postpone,
abridge	condense, shorten
abrogate	cancel, revoke
accelerate	hasten, speed up
accept	receive, take
accommodate	allow for
accompany	join, go with
accomplish	complete, finish
accomplish (a form)	complete, fill in
according to (an instruction)	per
accordingly	so, then
accrue	add, gain
accumulate	collect, gather
accurate	correct, exact, right
achieve	do, make
achieve the maximum	excel
acquire	gain, get, obtain
activate	begin, start
active consideration (to give)	consider
activities	actions
actual	real, true
actual emergency	emergency
actual facts	facts
actuate	drive, induce, move
additional	added, more, other
address	speak, deal with
adequate	enough, plenty
adjacent to	beside, next to
advanced plans	plans
advantageous	helpful, useful
adverse to	against, opposed to
advise	recommend, tell
advised (keep me)	inform me
affirmative (answer in the)	agree
affix	add, attach, place
affix a signature	sign
afford an opportunity	allow, let, permit
after the conclusion of	after
agency	office
aggregate	combined, entire, total, whole
aircraft	airplane, plane
all of	all
allegation	charge, claim
alleviate	ease, lessen
allotment	portion, share
along the lines of	like, similar to
alter, alteration	change
alternative	choice, option
amalgamate	combine, merge
ambient	surrounding
ameliorate	better, improve
and/or	use "and" or "or."
annually	yearly
antedate	precede
anticipate	expect, foresee
antipathy	dislike, distaste
antithesis	contrast, opposite
anxiety	fear
any or	any
apparent	clear, plain, visible
apparently	clearly, seemingly
appear	seem
appellation	name
append	add, attach
applicable	correct, proper
application	use
appreciable	many
appreciate	value
apprise	tell, inform
appropriate	proper, right, fit
approximately	almost, nearly
are desirous of	want to
are in receipt of	received
as a matter of fact	in fact
as a means of	to
as a result of	because of
as against	against
as and when	as, when (not both)
as at present advised	as advised
as of (this date)	by (today), today
as prescribed by	per, under
as to whether	whether, if
ascertain	learn, find out
assert	claim, declare
assimilate	absorb, digest, join
assist, assistance	aid, help
at a later date	later
at a much greater rate	faster, quicker

Instead of	*Try*
at all times	always
at an early date	soon
at present	now, currently,
at such time	when
at the present time	currently, now
at the time of	when
at this juncture (time)	now
at this time	now
at your earliest convenience	as soon as you can
attached herewith is	here's
attached please find	… is attached
attain	reach, achieve
attempt	try
attempt to	tries
attention is invited to	note, see
attired	dressed
augment	enlarge, increase
authored	wrote
authoritative	official, valid
authority	control, sanction
authorize	allow, let, permit
autonomous	independent
avail yourself of	use
availability	presence, use
B	
based on the fact that	because
be acquainted with	know
be cognizant of	know
be of assistance to	assist, aid, help
befall	happen, occur
behest	order, request
behoove	*don't use*
benefit	help
bestow	give
betterment	improvement
biannual	twice a year
biennial	once in 2 years
bilateral	two sided
bona fide	genuine, real
brief (in duration)	short, quick
brook (interference)	allow
burgeoning	growing, increasing
by means of	by, with
by virtue of	because, by, under
C	
came to an end	ended
cannot	can't
capability	ability
capable	able
care should be taken	be careful, take care
category	class, group
characteristic	trait
characterize	describe, portray
circuitous	roundabout
circumstances	conditions, facts
classify	arrange
close proximity	close, near
cognizant of	aware of, know
coincidentally	at the same time
collaboration	jointly, with
colloquy	discussion, talk
combine	join
combined	joint
comes into conflict	conflicts
commence	begin, start
commensurate	equal to, agree with
commensurate with	according to
communicate verbally	talk, discuss, say
compensate (compensation)	pay
comply (with)	follow, meet
component	part
comprehend	grasp, understand
comprehensive	thorough
comprise	contain, form
comprised of	consist of
concerning	about, on
conclude	close, decide, end
conclusion	end
concur	agree, approve
condition	state, event, facts
conduct (verb)	direct, lead
confront	face, meet, oppose
conjecture	guess
connection	link, tie
connotation	meaning
consensus of opinion	agreement
consequently	so, therefore
consider	regard, think about
considerable (amount)	large, great
consolidate	combine, join, merge
constitutes	is, forms
construct	build, make
consult	ask
consummate	finish, complete
contained in	in
containing	has, having
contains	has
contemporaneously	at the same time
contiguous	near, touching
continue	keep on
contractual agreement	agreement, contract
contribute	give
cooperate	help
cooperate together	cooperate
cooperation (in)	jointly, with
coordination	agree, relate
couched	phrased, worded
course of time	time

Instead of	*Try*
criteria	rules, standards
criterion	standard, norm
currently	now (or leave out)
D	
de-emphasize	play down
decelerate	slow down
deem	believe, think, judge
deficiency	lack, shortage
definitely	final
definitize	make definite
delegate authority	assign, empower
delete	cut, drop
delineate	describe, outline
delinquent	late
demeanor	conduct, manner
demise	death
demonstrate	explain, show
depart	leave
depict	describe, show
deprivation	loss
deprive	remove, withhold
derive	receive, take
derogatory	damaging
descend	go down
designate	appoint, assign, choose, name, pick
desire	wish, want
detailed	more, full
deteriorate	decay, run down
determination	ruling
determine	decide, figure, find
detrimental	harmful
develop	grow, make
dialogue, dialog	talk, discussion
dichotomy	split, separation
difficult	hard
dimension	size
diminish	decrease, reduce
disadvantage	drawback, handicap
disallow	deny, refuse, reject
disclose	show, reveal
discontinue	drop, stop, end
disseminate	issue, spread
distribute	allot, share, spread
divulge	reveal
do not	don't
donate	give
downward adjustment	decrease
due in large measure	because of
due to the fact that	because of, since
duplicate	copy
duration	time, period
during such time	while
during the periods when	when

Instead of	*Try*
E	
echelon	level, grade, rank
edifice	building
educator	teacher, trainer
effect (verb)	cause, make
effect an improvement	improve
effectuate	carry out
elaborate (on)	develop, expand on
elapsed (time has)	passed
elect	choose, pick
elementary	simple, basic
elevated	height, altitude
elicit	cause, prompt
eliminate	cut, drop, end, omit, delete, remove
elimination	removal, omission
elucidate	explain, clarify
emanates	emits, gives out
emergency situation	emergency
emphasize	stress, point out
employ	use
enable	let
encompass in	include, enclose
encounter	meet, find, meeting
encourage	urge, promote
end product or result	end, outcome, result
endeavor	try, effort, action
enhance	improve, increase
ensue	follow, result
enumerate	count, list
envisage	picture, view
equally as	as
equanimity	poise, balance
equitable	fair, just
equivalent	equal
eradicate	destroy, erase, remove
erroneous	wrong, mistaken
especially	chiefly
essential	necessary, vital
establish	show, make, set
estimate	appraise, conclude
evaluate	check, rate, test, analyze, measure
evaluation	rating
eventuate	result
every effort will be made	I (we) will try
everybody, everyone	each, all
evidence	fact
evidenced	showed
evident	clear, plain, obvious
evince	show, display
evolution	change, growth
exacerbate	aggravate
examination	check, checkup, test

Instead of	*Try*
examine	check, inspect, test
exceed	surpass
exceedingly	notable, very
excessive	too much, too many
execute	act, perform
exercise (authority)	use
exhaustive	thorough, complete
exhibit	show, display
exigency	need, emergency
exorbitant	abnormal, too much
expedite	hurry, rush, speed
expeditious	fast, quick, prompt
expend	pay, spend, use
expendable	consumed, replaceable
expenditure, expense	charges, cost, fee, loss, price
experience has indicated	experience shows
experiment	test, try, trail
expertise	skill, knowledge
explain	show, tell
expostulate	demand, discuss
extant	existing, current
extend	spread, stretch
extensive	large, wide
extenuating	qualifying, justifying
external	outer
extinguish	quench, put out
F	
fabricate	build, construct, invent, make
facilitate	ease, further, aid
factor	reason, cause
failed to	didn't
familiarity	knowledge
familiarize	inform, learn, teach
fatuous numbskull	jerk
feasible	possible, practical
females	women
final	last
finalize	complete, finish, end
firstly	first
foe	enemy
for example	such as
for the purpose of	for, to
for the reason that	because, since
for this reason	so
for your information	*don't use*
forfeit	give up, lose
formulate	make, devise
forthcoming	coming, future
forthwith	at once, now
fortuitous	lucky, fortunate
forward	send
fragment	piece, part
frequently	often
fullest possible extent	fully
function	act, role, work
fundamental	basic, main, primary
furnish	provide, supply
furthermore	besides, also
future date	sometime, later
G	
gained from the following	learned, obtained
gainsay	deny, dispute
generate	produce
germane	relevant, related
give consideration to	consider
give encouragement to	encourage, urge
give feedback	respond
give instruction to	instruct, direct
give rise to	cause, raise
goes without saying	*don't use*
govern	rule
H	
habituate	adapt, adjust
has the ability	can
has the capability	can
has the capability of	can, is able to
have the need for	need
have to	must
held a meeting	met
henceforth	until now
hereby	by this
herein	*don't use*
heretofore	until now
hiatus	gap, lapse
high degree of	more
hitherto	until now
hold in abeyance	delay, wait
homogeneity	unity, agreement
hopefully	I hope
however	but
I	
identical	same
identification	name, designation
identify	find, name, show
if and when	if or when (not both)
ilk	sort, kind
illustrate	show
immediately	at once, now
imminent	near
impact	affect (*v*), effect (*n*)
impacted	affected, changed
impediment	barrier, block
imperative	urgent
impetus	drive, power, force
implement	complete, fulfill
implication	effect, meaning

Instead of	*Try*
important	greater, major, main
impugn	attack, criticize
impulse	drive, push, thrust
in a manner similar to	as, like
in a number of cases	some, often
in a position to	can
in a satisfactory manner	satisfactorily
in a situation in which	when
in accordance with	according to, by, per
in accordance with the	AFI 37-xx requires
in addition to	also, besides, too
in an effort to	to, so, so that
in case of	if
in close proximity	close, near, nearby
in compliance with the	as directed/requested
in conjunction with	with, together
in connection with	in, with, on, about
in favor of	for
in its entirety	all of it
in lieu of	instead of
in order that	for, so, so that
in order to	to
in process of preparation	being prepared
in recent past	lately, recently
in reference to	regarding, concerning
in regard to	about, concerning
in relation to	about, concerning
in respect to	regarding, about, on
in sufficient time	early/soon enough
in the amount of	for, of
in the course of	during, in, when
in the event of	if
in the event that	if, in case
in the immediate future	soon
in the majority of instances	the time
in the matter of	in, on
in the nature of	like
in the near future	soon
in the negative	no, denied
in the neighborhood of	about, around
in the time of	during
in the vicinity of	near, around
in this day and age	today, nowadays
in this instance	here
in view of	since
in view of the above	so, since, therefore
in view of the fact that	because, as
in-depth	complete, thorough
inaccurate	wrong, incorrect
inadvertently	accidentally
inasmuch as	since, because
inaugurate	start, begin, open
inception	start, beginning
incident to	pertaining to
incidental	related, by chance
incombustible	fireproof
incorporate	blend, join, merge, combine, include,
increase	rise, grow, enlarge
increment	increase, gain
incumbent upon	must
indebtedness	debt
indefinite	vague, uncertain
indeterminate	vague, uncertain
indicate	show, point out
indication	sign, evidence
individual *(noun)*	person, member
individually	each, singly
ineffectual	ineffective, useless
inexpensive	cheap, low-priced
infinite	endless
inflammable	flammable
inherent	basic, natural
inimical	hostile, unfriendly
initial (adjective)	first
initially	first, at first
initiate	start, begin, act
innate	basic, native
innuendo	hint
input (provide)	comments, thoughts
insignificant	slight, trivial
insofar as	since, for, because
insomuch as	since
instance	case, example
instantaneously	instantly, suddenly
institute (verb)	begin, start
integrate	combine
interface	connect, join, joint, junction, merge, coordinate
interpose no objection	don't object
interpose objections to	disapprove, object to
interpret	explain, grasp
interrogate	question
investigate	examine, study
irrespective (of the fact that)	regardless
is dependent upon	depends on
is in receipt of	receives
is responsible for obtaining	obtains
is responsible for selection	selects
it is	*don't use*
it is essential	must
it is important to note that	note
it is obvious that	clearly, obviously
it is possible that	may, possibly
it is recommended	I, we recommend
it is requested	please, request

Instead of	*Try*
J	
jeopardize	endanger
jurisdictional authority	control
justification	grounds, reasons
justify	prove
juxtaposition (in)	alongside, next to
K	
knowledge	experience
L	
legislation	law
limitations	limits
limited number	few
locate	find
location	place, scene, site
M	
magnitude	size, extent
maintain (maintenance)	keep, support
majority	greatest, most
make a decision	decide
make a reply	reply
make a request	request, ask for
make a statement	state
make an adjustment	adjust, resolve
make every effort	try
make provisions for	provide
mandatory	must, required
manifest (to be)	clear, plain
manufacture	make, build
materialize	appear, take form
materially	greatly
maximal	highest, greatest
maximize	increase
maximum	most, greatest
meet with approval	is approved
mention	refer to
metamorphosis	change
minimal	least, lowest, smallest
minimize	decrease, reduce
minimum	least, lowest
mitigate	lessen, ease
mode	way, style
modify	change, moderate
monitor	check, watch
more specifically	for example
most unique	unique
multitudinous	populous, large
N	
nebulous	vague
necessitate	cause, need, require
negligible	small, minimal
neophyte	new, novice
nevertheless	however, but
not infrequently	often
not later than	by, before
not often	seldom
not withstanding the fact that	although
notification	notice
notify	tell
numerous	many, most
O	
objective	aim, goal
obligate, obligatory	bind, compel
observe	see
obtain	get
obviate	prevent, remove
obvious	plain, clear
of great importance	important
of large dimensions	large, big, enormous
of late	lately
of no avail	useless, no use
of the opinion (to be)	believe, think
often times	often
on account of	because
on behalf of	by, for
on the basis of	based on
on the grounds that	because
on the part of	for
operate	run, work
operation	action, performance
operational	working
optimize	improve, strengthen
optimum	best, greatest
option	choice, way
opus	work
organization	makeup, work site
orifice	hole, vent, mouth
originate	begin, create, start
outlook	view
outstanding (debt)	unpaid, unresolved
over the signature of	signed by
overlook	omit, view, sight
P	
parameters	limits, factors
paramount	superior, chief
partake	share
participate	take part
particularize	*don't use*
patently	evidently
peculiar to	unusual
penitentiary	prison
per annum	each year, a year
perform	act, produce
period of time	period, time
periodic	cyclic, recurring
periphery	confines, limits
permit	let
pernicious	deadly, harmful
personnel	people, staff

Instead of	*Try*
pertaining to	about, of, on
pertinent	to the point
peruse	read, study
phenomenon	fact, event
pictured	shown, imagined
place	put
plaudits	praise, approval
plethora	excess
point in time	time, now, then
point of view	*don't use*
portend	predict, mean
portent	sign, omen
portion	part, share, lot
position	place
positively	*often unnecessary*
possess	have, own
posterior	rear, end, rear end
postpone	delay, put off
postulate (*verb*)	claim, assert, suggest
posture (on an issue)	view, position
potential (*adjective*)	possible
practicable	possible, workable
practically (finished)	almost, nearly
precept	order, principle, rule
precipitate (*adjective*)	hasty, rash, sudden
preclude	prevent
predicament	fix, dilemma
predicated on	based on
predominant	chief, main
predominantly	chiefly, mainly, mostly
preeminent	chief, foremost, first
preliminary to	before
premier	first, leading
preparatory to	before
prepared	ready
preponderantly	chiefly, mainly
presently	now, soon
preserve	keep
prevail upon	persuade
prevalent	widespread
preventative	preventive
previous	earlier, past
previous to	before
previously	before
primary	first, chief
prime	best
prior to	before
prioritize (no such word)	rank, order
probability	chance, likelihood
problematical	doubtful
procedures	rules, ways
proceed	do, go on, try
procure	get, gain
proficiency	skill, ability
profound	deep
programmed	planned
prohibit	prevent, forbid
projected (*verb*)	planned
promulgate	announce, issue
proportion	amount, part, share
proposal	plan, offer
prototype	first, original, model
provide	give, furnish, supply
provide for	care for
provided that	if
provides guidance for	guides
provisions (of a law)	terms
(the) provisions for	*omit*
proximity	nearness, distance
purchase	buy
purport	claim, mean
pursuant to	per, according to
purvey	supply, provide, sell
purview	range, scope
Q	
quantify	count, measure
R	
rationale	reason
reach a decision	decide
reason for	why
reason is because	because
recapitulate	sum up, summarize
recipient	receiver
recommend	propose, suggest
recommendation	advice, opinion
reduce	cut
referred to as	called, named
reflect	say, show
regarding	about, of, on
regardless	in spite of, no matter
reimbursement	payment, repayment
reiterate	repeat
related with	on, about
relating to	about, on
relative to	on, about, for
relocation	move
remain	stay
remainder	rest
remedy	cure
remittance	payment
remove	take away
remuneration	pay, payment
render	give, make, report
repeat again	repeat
replete	full, filled
represent	stand for, depict
reproduce, reproduction	copy
request	ask, please

Instead of	*Try*
require	must, need
requirement	need
requisite	needed
reside	live
retain	keep
review	check
rudiments	basics
S	
salient	main, important
salutary	good, healthy
sans	without
satisfactory	fine, good
saturate	soak, fill
scant	little, only
scrupulous	careful
scrutinize	study carefully
segment	part
seldom ever	seldom
selection	choice
serves to	acts, helps, works
significance	meaning, importance
significant	main, important
signify	mean, show
similar to	like
sine qua non	essential
situated	placed, located
small in size	small
so as to	to
solicit	ask for
solitary	lone, single
somewhat	*don't use*
specifications	terms, details
specify	list
square in shape	square
state (*verb*)	say
statutory	legal
still remains	remains
stimulate	stir, arouse
stipend	salary, payment, fee
strict accuracy	accuracy
stringent	tight, strict
subject	the, this, your
subject to examination	check, examine
submit	offer, give, send
subordinate (*verb*)	lower, subdue
subordinate commands	their commands
subsequent to	after, later, next
subsequently	after, later, next, then
substantial	large, solid, strong
substantiate	prove, support
substitute (*verb*)	replace
succor	help, aid
succumb	die, yield
such	similar, like
such as	like
sufficient	enough, ample
sufficiently in advance	early enough
sum total	sum, total
superfluous	extra, useless
supervise	manage
supposition	belief, thought
surmise	think, guess, suppose
susceptible to	open to, subject to
symptom	sign
(is) symptomatic of	shows
synthesis	merging, combining
synthesize	group, assemble
T	
tabulation	table
take action	act
take appropriate measures	please
take necessary action	act
take necessary steps	do
technicality	detail, fine point
technique	method, way
tender (*verb*)	offer, give
tentative	uncertain
terminate	end, stop
terrible disaster	disaster
that	*omit if possible*
that aforesaid	*don't use*
the fact that	*don't use*
the following	this, these
the foregoing	these, those
the fullest degree possible	fully
the question as to whether	whether
the undersigned is desirous of	I want
thence	from there
therapy	treatment
there are	*don't use*
there is	*don't use*
thereafter	afterward, then
thereby	by that, by it
therefore	so
therein	*don't use*
thereof	of, its, their
thereon	*don't use*
thereto	to that, to it
thereupon	at once
thirdly	third
this office	us, we
this point in time	now
thither	there
through the use of	by, with
thus	so
thwart	frustrate, block, stop
time period / frame	period, span, time
timely basis	promptly, quickly

Instead of	*Try*
to be aware of	know
to effectively direct	direct
to the extent that	as far as
transcend	go beyond
transformation	change
transmit	send
transparent	clear
transpire	happen, occur
transport	carry, move
transverse	crosswise
trauma	shock
true facts	facts
type	*don't use*
U	
ultimate	final, end
ultimately	in the end, finally
under advisement	*don't use*
under separate cover	*don't use*
underprivileged	poor, deprived
understand	know
unintentionally	accidentally
until such time as	until, when
upgrade	improve
upon	on
upward adjustment	raise, increase
usage	use
(the) use of	*don't use*
utilize, utilization	use, employ
V	
validate	confirm
value	cost, worth
variation	change
velocity	speed
vend	sell
verbatim	exact
veritable	*don't use*
very	*omit if possible*
very last	last
very least	least
via	in, on, through
viable	workable
vicinity of	close, near
vicissitudes	changes, difficulties
vie	compete
virtually	almost
visualize	see, imagine, picture
vitiate	weaken, spoil, impair
voluminous	bulky, large
W	
warrant	call for, permit
whence	from where
whenever	when, each time
whereas	since, while
whereby	by
wherein	where
wherever	where
wherewithal	means
whether or not	whether, if
will be effected	will be completed
will make use of	will use
with a view to	to, for
with due regard for (or to)	for
with reference to	on, about
with regard to	about, concerning
with the exception of	except, but
with the purpose of	to
with the result that	so
within the purview of	under
withstand	stand, resist
witnessed	saw
/	and, or